

V

833

.A5

1909



Class V 833

Book . A 5

1909

TORPEDO BOATS

STATEMENT

BEFORE THE

COMMITTEE ON CLAIMS

OF THE

HOUSE OF REPRESENTATIVES

ON

HOUSE BILLS 6041 AND 15101, SIXTIETH CONGRESS, FIRST
SESSION, FOR THE RELIEF OF THE BATH IRON WORKS
AND OTHERS

JANUARY 19, 1909

STATEMENTS OF

HON. FRANK W. HACKETT, HENRY W. DUNN, Esq.,
AND CLARENCE W. DeKNIGHT, Esq.,

OF COUNSEL FOR CLAIMANTS

COMMITTEE ON CLAIMS, HOUSE OF REPRESENTATIVES OF THE UNITED STATES, SIXTIETH CONGRESS

MEMBERS OF COMMITTEE

JAMES M. MILLER, KANS., CHAIRMAN.

CHARLES Q. TIRRELL, MASS.

JOSEPH HOWELL, UTAH.

WILLIAM H. GRAHAM, PA.

GEORGE E. WALDO, N. Y.

GRANT E. MOUSER, OHIO.

CHARLES A. LINDBERGH, MINN.

WILLIS C. HAWLEY, OREG.

IRA W. WOOD, N. J.

HENRY M. GOLDFOGLE, N. Y.

CLAUDE KITCHIN, N. C.

EZEKIEL S. CANDLER, JR., MISS.

DORSEY W. SHACKLEFORD, MO.

JAMES O. PATTERSON, S. C.

JOHN A. M. ADAIR, IND.

ELMER L. FULTON, OKLA.

A. P. MYERS, CLERK.

J. W. GARDNER, ASSISTANT CLERK.

WASHINGTON

GOVERNMENT PRINTING OFFICE

1909

2

TORPEDO BOATS

STATEMENT

BEFORE THE

COMMITTEE ON CLAIMS

OF THE

U.S. HOUSE OF REPRESENTATIVES

ON

HOUSE BILLS 6041 AND 15101, SIXTIETH CONGRESS, FIRST
SESSION, FOR THE RELIEF OF THE BATH IRON WORKS
AND OTHERS

JANUARY 19, 1909

STATEMENTS OF

HON. FRANK W. HACKETT, HENRY W. DUNN, Esq.,
AND CLARENCE W. DEKNIGHT, Esq.,

OF COUNSEL FOR CLAIMANTS

COMMITTEE ON CLAIMS, HOUSE OF REPRESENTATIVES OF THE UNITED STATES, SIXTIETH CONGRESS

MEMBERS OF COMMITTEE

JAMES M. MILLER, KANS., CHAIRMAN.

CHARLES Q. TIRRELL, MASS.

JOSEPH HOWELL, UTAH.

WILLIAM H. GRAHAM, PA.

GEORGE E. WALDO, N. Y.

GRANT E. MOUSER, OHIO.

CHARLES A. LINDBERGH, MINN.

WILLIS C. HAWLEY, OREG.

IRA W. WOOD, N. J.

HENRY M. GOLDFOGLE, N. Y.

CLAUDE KITCHIN, N. C.

EZEKIEL S. CANDLER, JR., MISS.

DORSEY W. SHACKLEFORD, MO.

JAMES O. PATTERSON, S. C.

JOHN A. M. ADAIR, IND.

ELMER L. FULTON, OKLA.

A. P. MYERS, CLERK.

J. W. GARDNER, ASSISTANT CLERK.

WASHINGTON

GOVERNMENT PRINTING OFFICE

1909

V833
A5
1909
[H. R. 6041, Sixtieth Congress, first session.]

A BILL For the relief of the Bath Iron Works and others.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury be hereby authorized and directed to pay, out of any money in the Treasury not otherwise appropriated, to the several builders of the twelve torpedo boats and sixteen torpedo-boat destroyers authorized by the act of Congress making appropriations for the naval service approved May fourth, eighteen hundred and ninety-eight, namely, the Bath Iron Works, of Bath, Maine; the George Lawley and Son Corporation, of Boston, Massachusetts; the Fore River Ship and Engine Company, of Quincy, Massachusetts; the Gas Engine and Power Company, and Charles L. Seabury and Company, Consolidated, of New York; Lewis Nixon, of the Crescent Shipyard, of Elizabeth, New Jersey; the Harlan and Hollingsworth Company, of Wilmington, Delaware; the Maryland Steel Company, of Baltimore, Maryland; the Columbia Iron Works and Dry Dock Company, of Baltimore, Maryland; the W. R. Trigg Company, of Richmond, Virginia; the Union Iron Works, of San Francisco, California, the fair average cost of said boats without profit, as determined by the board of naval officers of which Rear-Admiral F. M. Ramsay, United States Navy, retired, was president, and as specified in their report to the Secretary of the Navy dated April ninth, nineteen hundred and two, namely, two hundred and twenty-four thousand three hundred dollars for each torpedo boat, and three hundred and seventy-four thousand two hundred dollars for each torpedo-boat destroyer, deducting from said sums for each boat satisfactorily completed and delivered the amount already paid said firms on account of said boats.

SEC. 2. That this act shall take effect upon its passage.

[H. R. 15101, Sixtieth Congress, first session.]

A BILL For the relief of the Bath Iron Works and others.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the claims of the Bath Iron Works, of Bath, Maine; the George Lawley and Son Corporation, of Boston, Massachusetts; the Fore River Ship and Engine Company, of Quincy, Massachusetts; the Gas Engine and Power Company, and Charles L. Seabury and Company, Consolidated, of New York; Lewis Nixon, of the Crescent Shipyard, of Elizabeth, New Jersey; the Harlan and Hollingsworth Company, of Wilmington, Delaware; the Maryland Steel Company, of Baltimore, Maryland; the Columbia Iron Works and Dry Dock Company, of Baltimore, Maryland; the W. R. Trigg Company, of Richmond, Virginia; the Union Iron Works, of San Francisco, California, be, and they are hereby, referred to the Court of Claims with jurisdiction to ascertain and find the difference between the amount actually paid and the cost to them, respectively, for the construction of torpedo boats and torpedo-boat destroyers, pursuant to the act of May fourth, eighteen hundred and ninety-eight, and to enter judgment therefor, notwithstanding the bar of the statute of limitations: *Provided*, That no suit shall be brought under the provisions of this act after six months from the passage thereof: *Provided further*, That either the Government or claimant may offer the findings of the Ramsay Board as to the fair average cost of said vessels, which shall be received as prima facie evidence thereof.

NOTE.—The Neafie & Levy Ship and Engine Building Company, Philadelphia, Pa., was omitted from both bills by mistake.

C E 9 2 2 5 7

TORPEDO BOATS AND TORPEDO-BOAT DESTROYERS.

COMMITTEE ON CLAIMS,
HOUSE OF REPRESENTATIVES,
Tuesday, January 19, 1909.

The committee met at 10.30 o'clock a. m., Hon. James M. Miller (chairman) presiding.

Present as of counsel for the claimants, Hon. Frank W. Hackett, of Washington, D. C.; Henry W. Dunn, esq., of Boston, Mass.; Clarence W. De Knight, esq., of Washington, D. C.

The CHAIRMAN. This matter before the committee this morning is the claim of the Bath Iron Works and others. We are ready to hear you, gentlemen.

STATEMENT OF HON. FRANK W. HACKETT, OF WASHINGTON, D. C.

Mr. HACKETT. Mr. Chairman, we want to thank the committee for according us the privilege of coming here. I will take up only a moment's time, because we have here a gentleman from Boston who has made a thorough study of this case, and who is prepared to state all the facts; and more than that, he would welcome questions from the committee. All I want to say is this, that we come here upon the recommendation of the Secretary of the Navy, and we are not asking anything more than is right and fair and such as I believe that every member of this committee, if he understands the facts, will agree is right and fair. This is one of those cases where it is very easy to go wrong if you do not know all the facts, and the facts are difficult of ascertainment. I want to thank certain members of this committee who appear in the reports of these previous hearings to have asked questions showing that they have studied the subject. One or two of them are here to-day, and it is those members of the committee particularly that we wish to reach. We have nothing but the desire that pertinent questions be put by members of the committee. All I want to say before I sit down is this, that I would not be here and Mr. Powers would not be here representing these claims if we did not honestly believe that this was a case where the Congress would be only too glad to make restoration provided they see their way clear to do it.

This is not the ordinary case of a man who is supposed to know all the matters of a business and undertakes a business risk and fails in it. It is not that at all. These shipbuilding firms—and it is very important that they should be encouraged in their work so that in time of war we may have those firms to go to—these people honestly and fairly sat

down with the government representatives at the Navy Department and started in on something that was entirely new to them. That is down at the bottom of this whole thing, that the project was a new one. They did the best they could, and they supposed that the upset price set by the Government was enough to cover the expenditures; but through no fault of theirs it turns out that they have lost a great deal of money. We are not here asking a cent of profit, nor are we asking that the figures be made so as to include all the items of cost, because when you get down to the bottom of it you find that the Ramsay Board does not include all the items. The work was done, the boats were built, and the Government got the boats, and all we ask is that the Government will pay not what those boats cost but a very conservative estimate of their fair value, which is less than they actually cost.

With these remarks merely as introductory, I want to present to the committee Mr. Henry W. Dunn, of Boston, who is associated with Mr. Powers and a member of his firm, Mr. Powers not being able to be here to-day.

Mr. KITCHIN. I believe it is understood that the Government did not fool or deceive any of these firms or contractors?

Mr. HACKETT. No; no intentional deception in this case at all.

Mr. KITCHIN. And that the contractors took the contracts with their eyes open?

Mr. HACKETT. They took them, relying on the government estimates, which they supposed to be sufficient.

Mr. KITCHIN. And they are asking now the difference between the contract price and what it actually cost them?

Mr. HACKETT. Less than it actually cost them.

Mr. KITCHIN. They have made a loss—they had a loss on the contracts—and they want the Government to make that good?

Mr. HACKETT. Yes; that is true, except that they don't ask for all their loss.

Mr. KITCHIN. You would not advise that as a general principle for the Government to go on, to make contracts with folks, and then have it understood that the Government would sustain all losses?

Mr. HACKETT. Of course not, Mr. Kitchin.

Mr. WALDO. Does it not appear in the evidence that there are one or two of these companies that did not make any loss?

Mr. HACKETT. Yes; not two. I think the Union Iron Works, of San Francisco, was the only one.

Mr. WALDO. The Bath Iron Works made a loss?

Mr. HACKETT. The Bath Iron Works lost \$189,000.

Mr. WALDO. The Union Iron Works, of San Francisco, did not?

Mr. HACKETT. They did not lose, I believe.

Mr. DUNN. Oh, yes.

Mr. HACKETT. Mr. Dunn knows about that.

Mr. DUNN. Yes, they did. I want to step right in there.

The CHAIRMAN. Very well, we will hear Mr. Dunn.

ARGUMENT OF HENRY W. DUNN, ESQ., OF BOSTON, MASS., REPRESENTING THE BATH IRON WORKS, OF BATH, ME., AND THE OTHER BUILDERS.

Mr. DUNN. The Union Iron Works lost a large sum on their contract, Mr. Chairman.

Mr. WALDO. Was there not one of the companies that did not make a loss?

Mr. DUNN. No; there was none. The fair average cost, as reported by the Ramsay Board, which it is proposed to pay to the contractors, was an average sum so as to make the price received by everybody the same. Now, that fair average cost would give to the Union Iron Works something like \$20,000 over and above the \$351,783 that they reported their boats to have cost them.

Mr. WALDO. How much loss do they claim to have made?

Mr. DUNN. Their contract price was \$294,610. The actual cost to them, as reported, was \$351,783. In other words, they lost about \$57,000 per boat, or \$171,000. Not only is it true that the sum they would receive under this bill would be only a very small figure over the actual cost which they reported, but the actual cost which they reported does not include some items of their loss. I was intending to come to that later.

Mr. WALDO. You may proceed in your own way.

Mr. DUNN. I might as well say right here that all of these contractors lost very largely from the increase in general expense by reason of delays, partly through not getting materials and partly through delay over the approval of plans and the working out of designs, and this increase in the general expense does not appear in the figures reported or the relief asked. Of course the item of general expense in any manufacturing business is a very large item, and it is a large item in the case of these shipbuilders. This includes such things as salaries of general officers, clerks, stenographers, engineers, firemen, foremen and superintendents, office expenses, taxes, insurance, freight, power, light, heating, water rates, depreciation of plant and buildings, repairs, advertising, legal charges, telegraph, telephone, and so forth.

Mr. WALDO. These companies were building other ships meanwhile; this was not their only business that they had?

Mr. DUNN. Yes; but of course every manufacturer, if he is not going to do business at a loss all the time, has to charge, to all the business that is getting the benefit of this general expense, a certain portion of the general expense. This charge is determined by ascertaining the average ratio of the total general expense of the concern to the total cost of labor (in some yards labor and material) on all the work done in the yard and then adding to the labor cost of each piece of work (or labor and material cost) the percentage thus ascertained. If all the work in the yard proceeds at normal speed, this percentage, added to the labor cost (or labor and material cost) of each piece of work, will cover the total general expense.

Now, the amount that ought to have been and would fairly have been chargeable to these boats on account of general expense was of course exactly twice as large if it took twice as long for a boat to build. But, nevertheless, in the figures of actual cost which they reported to

the board and in the figures of fair average cost that the Ramsay Board made up they added the same percentage of the labor cost for general expense as if there had been no delay.

For example, suppose a boat would have taken two years to build with no delay and the labor cost would have been \$100,000, and 40 per cent of that, or \$40,000, would have been added for general expense. If by reason of delays the boat actually took four years to build, the labor cost would undoubtedly be somewhat increased, but nowhere near doubled, while the charge for general expense ought properly to be doubled. That worked out in this way. Suppose the delay increased the labor cost to \$110,000. The same percentage was added for general expense—40 per cent of \$110,000, or \$44,000. Yet the charge for general expense, to make the builder whole, ought to have been, not \$44,000, but \$80,000. In other words, the figures reported include practically no allowance for increase in the general expense chargeable to the boats by reason of delay, although that was, in fact, an element representing a loss of a great many thousands of dollars to the contractors, because this work took up space in the yards and required attention from their force, which for the time being could not be given to other work, commercial work, and while the work on the boats was delayed and held up the general expense was going right on all the time.

Mr. WALDO. Is it your claim that this delay was caused by the Government?

Mr. DUNN. A considerable part of it was, as I shall show later. I do not want to go into that now. But the point I am making is that the figures which the Union Iron Works returned as their actual cost, which are slightly less than the fair average cost fixed by the Ramsay Board, do not include that item of increased general expense, which was, as all the builders testified, a very large item. If that item were included, undoubtedly the cost would exceed the fair average cost fixed by the Ramsay Board.

Mr. KITCHIN. You speak of the general expenses, such as salaries, and so forth. What per cent does that bear to the total?

Mr. DUNN. The Ramsay Board went into that question. They investigated the methods used by a great many of the contractors, and finally adopted the method used by the oldest yards, which had the oldest established business, and therefore charged the lowest percentage for general expense, and that method was to charge—

The CHAIRMAN. What page is that on?

Mr. DUNN. I have before me the statement made by the committee of builders, Mr. Myers and Mr. Bowles and Mr. Wilson, and that is referred to on page 15. The percentage finally fixed by the board was 45 per cent of the cost of labor alone for the destroyers and 50 per cent for the torpedo boats. You will find this on page 16; that is to say, to the cost of labor, which was about 44 per cent, I believe of the entire cost of the work, they added 45 per cent of that, which would be about 16 per cent of the entire cost of the work, as the fair proportion of general expense, that being the proportion which the experience of the older yards had found came out accurately, and just about repaid those expenses in ordinary commercial work.

Mr. KITCHIN. My difficulty is this: Suppose a boat would cost a million dollars; what per cent of that would be the general expense you refer to?

Mr. DUNN. It would be, roughly, 15 or 16 per cent.

Mr. KITCHIN. And what per cent of it would be labor?

Mr. DUNN. Roughly, 44 per cent of what was left after you had taken out the general expenses.

Mr. KITCHIN. And the balance would be material?

Mr. DUNN. Yes.

Mr. KITCHIN. I believe Admiral Bowles testified that 14 per cent would be general expense and 31 per cent would be labor and 56 per cent would be material. That is about right, is it not?

Mr. DUNN. I think there was a misunderstanding there between Mr. Bowles and the committee, or perhaps I misunderstand him. He said the labor cost was 44 per cent.

Mr. KITCHIN. That included the general expense and labor cost.

Mr. DUNN. I am not sure that it does,

Mr. KITCHIN. Here is what he testified to on page 13 of the hearings of 1904. He said that the material cost was 56 per cent.

Mr. DUNN. Yes.

Mr. KITCHIN. That the general expense and the labor cost was 44 per cent. He said that 31 per cent was labor and the balance general expense.

Mr. DUNN. Yes, but he comes to this conclusion. He testified when you asked him, as follows:

Mr. KITCHIN. Thirty-one per cent of 44 per cent would be about 60 per cent, then?

Admiral BOWLES. Yes, sir.

That is evidently incorrectly reported, but it indicated to me that his 44 per cent did not include the general expense, which was to be added to that. Then, in answer to Mr. Butler, he testified as follows:

Mr. BUTLER. Suppose a contract would be \$100; \$56 of it would be set apart for material?

Admiral BOWLES. Yes, sir.

Mr. BUTLER. Forty-four dollars of the \$100 for labor?

Admiral BOWLES. Yes, sir; and about \$14 for expense.

Mr. BUTLER. To which Mr. Kitchin has just referred?

Admiral BOWLES. Yes, sir.

The CHAIRMAN. That would make a total cost raised \$114 on the basis of his estimate?

Admiral BOWLES. Yes, sir.

Mr. KITCHIN. Then he expressly said that 31 per cent of the 44 per cent would make the 14 per cent—about 14 per cent?

Mr. DUNN. If that is what he meant, then that makes 31 per cent for labor, 13 per cent for general expense, and 56 per cent for material.

Mr. WEEKS. I was talking with Admiral Bowles about that general proposition just two or three months ago, and he said something less than one-half would be general expense and labor, a trifle more than one-half material. He said it might vary somewhat, depending on the character of the ship that was being built.

Mr. DUNN. That confirms the statement made here.

Mr. KITCHIN. Yes.

Mr. DUNN. I think, however, that Mr. Bowles was in error when he said that the Ramsay Board added 31 per cent of the labor cost for general expense, and that the figures given on page 16 of the "Statement of the builders" are the correct ones. I will submit later a table to be printed with this argument, showing the elements making up the fair average cost reported by the Ramsay Board.

I want to say just one word more about the figures of the Union Iron Works. A great many different ways might have been taken to

fix this compensation. As a matter of fact the Navy Department chose to adopt a method which would make the price the same to all the builders, and the price that it is proposed to pay will still leave, even on these reported figures which do not include the increase in general expense, a loss to all the other builders running from a small sum to as much as \$50,000 or \$75,000 per boat; in fact, some of the builders, 6 of the builders, will still be out of pocket on all their boats more than \$100,000 after this price has been paid.

As to the difference between the cost of the boats of the Union Iron Works and those of the other 10 builders, which were all very much higher, the only evidence I have is that a comparison of the detailed statements shows that the requirements imposed upon them as to miscellaneous fittings and equipment were very much lower than those imposed upon the other builders. Their hulls and their machinery cost more than those of the Fore River Company, which has one of the largest losses. They were let off immensely easier on the electric plant, miscellaneous equipment, and fittings, matters which were largely in the discretion of the government inspectors. The fact is that they will not make \$20,000 profit, because of the increase in general expense which is not allowed for. They will come out probably about whole. The others will still lose, and several of them more than \$100,000. Now, if the builders are satisfied with that inequitable method of distributing the compensation asked for, I suppose—I had assumed—that the committee would be equally satisfied. The builders might very well have asked that the compensation be graded according to their losses. They did not choose to do so; the other method was so much the simpler and was the one adopted.

What I have said thus far has been merely preliminary, and in answer to the question that was asked about the loss of the Union Iron Works. Incidentally I have referred to the fact, which I would like the committee to bear in mind, that none of the builders in reporting their actual cost included any increased allowance for general expense because of delay, and the Ramsay Board does not make any such increased allowance. In other words, there is one item of loss, which the builders who testified before this committee said was a very serious one, which is not included in any of the figures reported or in the compensation asked for. It is, moreover, an item which might very properly have been included, because it was the result of delay, and, as I shall show you later, the delay was very largely the fault of the Government.

Now, I want to start in at the beginning of this matter and state as nearly as I understand it what is the basis of the whole contention. Under the act of 1898 11 firms contracted to build 12 torpedo boats and 16 destroyers. It was not a case, as suggested in one of the hearings, of inexperienced builders excluding experienced builders by low bids. The only experienced bidder that did not get a boat was the Herreshoff Manufacturing Company. Their bid came in after the bids were closed, and it was one of the highest of the bids, but not as high as one or two of the others that were accepted. The other people who were not awarded contracts—there were only two or three—were those who were wholly without experience in building government vessels, and one of them had no experience in any part of the shipbuilding business. The average contract price was about \$153,000 for the torpedo boats.

Mr. WALDO. Will you state what the actual bids and actual prices were of each concern?

Mr. DUNN. The Bath Iron Works's bid for torpedo boats was \$161,000; George Lawley & Son Corporation bid \$163,000; Lewis Nixon bid \$167,000; William R. Trigg Company bid \$131,000. Those figures I am reading include a small amount of extras. Perhaps I had better give the exact contract prices here on pages 9 and 10 of S. Doc. No. 112, with which the committee are familiar. It was that document in which Secretary Long forwarded a great many papers to the Senate committee. The exact contract prices are given. They are as follows: The Bath Iron Works, \$161,000; George Lawley & Sons, \$159,400; Lewis Nixon, \$165,000; William R. Trigg & Co., \$129,750; the Gas Engine and Power Company, \$146,000; the Columbian Iron Works, \$168,000; the average being over \$152,000.

For the destroyers Neafie & Levy bid \$283,000; William R. Trigg & Co., \$260,000; Harlan & Hollingsworth, \$291,000; the Fore River Company, \$281,000; the Union Iron Works, \$285,000; the Gas Engine and Power Company, \$282,000; and the Maryland Steel Company, \$286,000; averaging \$281,750.

Mr. KITCHIN. Are those the torpedo-boat destroyers?

Mr. DUNN. Yes; those are the torpedo-boat destroyers. This is all given in S. Doc. No. 112, of the Fifty-eighth Congress, second session, at pages 9 and 10. I have here three books to which I am referring. I have that document, and the record of the hearings before the House committee, beginning November 25, 1904, and extending to March 9, 1905, where testimony was taken, and the record of the Senate hearings in 1904.

Mr. KITCHIN. Right along in that connection; that was the contract price. Now, give what they estimated it actually cost them to build these boats.

Mr. DUNN. That is exactly what I was going to give next. The average contract price, including extras, was \$154,580 for the torpedo boats.

Mr. WALDO. We do not care about that. Let us have the actual price of each company set opposite what it cost them.

Mr. DUNN. You would like to have all in detail?

Mr. KITCHIN. If you have not those figures you can put them in afterwards.

Mr. DUNN. I have those figures right here. Now, I want to say one word to correct the misapprehension that apparently arose at one of the previous hearings of the committee. There was a small amount of allowances for extras amounting to a very few thousand dollars in all these millions of dollars involved. The changes that were made in the designs as the work went along, which I shall have to refer to later, were 99 per cent of them changes that were permitted within the general language of the specifications and for which no extras were allowed. I want to say that, because the reference to extras that I have got to make might otherwise be misunderstood. I doubt if the amount of extras allowed to any one builder here exceeded \$5,000 in any one case. The allowances for extras can practically be disregarded. In the figures that are given in this "Statement of the Builders," on page 13, you have the contract prices adjusted so as to include the extras or allowances. If a man did get, as one company did get, \$2,000 of extras allowed, the price I give is

the price he received, both contract price and extras, so that it makes it more accurate on the actual loss. The figures of actual cost in the "Statement of the Builders" are also more accurate, because later than those on page 9 of Senate Document 112.

The Bath Iron Works, contract price, and extras and deductions, \$161,517. Actual cost reported to the committee, \$224,614; actual loss, \$63,097 on each of three boats, or very nearly \$200,000.

George Lawley & Sons, contract price and extras, \$163,884; actual cost, \$273,157; actual loss, \$109,273 on the first boat. The second boat apparently cost them a little less for completion, \$263,666 for actual cost and \$163,511 for contract price and extras. The loss was \$100,155.

Lewis Nixon, the contract price was \$167,212.14; actual cost, \$278,827; loss on each boat (two boats), \$111,614; total, \$223,000 for two boats.

William R. Trigg Company, the contract price and extras on the first boat were \$131,914; actual cost, \$243,741; loss, \$111,827. Contract price and extras on the second boat, \$127,861; actual cost, \$243,741; loss, \$115,880. On the third boat the figures are substantially the same as on the first, the actual loss being \$112,601.

The Columbian Iron Works, the contract price was \$168,770, the actual cost was \$289,491, and the loss on one boat was \$120,720.

The Gas Engine and Power Company, the contract price was \$148,906, the actual cost was \$243,189, and the loss was \$94,282.

Would you like each of the destroyers separately read?

Mr. WALDO. I see you have all the figures there. It is not necessary to read them.

Mr. DUNN. It is given on page 13 of this statement of the committee of builders.

Mr. WALDO. That is their statement and not the hearing?

Mr. DUNN. This is a statement of the committee, consisting of Mr. Bowles, Mr. Myers, and Mr. Wilson. I would state to the gentleman that those figures are all taken from tables that are in the papers before the committee.

Mr. KITCHIN. Filed by the Ramsay Board?

Mr. DUNN. The returns of actual cost to the Ramsay Board were partly estimated, most of the boats not being entirely completed. Corrected figures were later submitted at the hearings before this committee and the Senate committee in 1904, and the corrected figures are used in the "Statement of the builders." The differences are slight.

Now, to lump these results and give simply an idea of where we start in: On an average contract payment of \$154,580 for torpedo boats there was an average actual cost of \$252,685, nearly \$100,000 more; and on the average contract price of \$286,689 for destroyers there was an average actual cost of \$411,654, or almost \$125,000 loss. There are two things of great importance that I want the committee to note in regard to those figures of actual cost. In the first place they do not include any profit or interest on the investment, or anything of the sort. They do not represent what the price ought to have been to correspond with the usual contract. They represent actual cost without any interest or profit. In the second place they do not include, as I have stated, any proportionate allowance for the

increase in general expense resulting from the delay in the building of these boats.

Mr. KITCHIN. Were these boats—or these torpedo boats—all of the same kind, the very same? I see there is a little difference in the prices in the bids. Was that made because the boat was a little differently described or was a little different?

Mr. DUNN. No, sir; most of these were built on the department's designs and substantially similar in the main outlines, although, as I will point out later, most of the details were worked out by the superintending constructor, and they differed in details as they were finished. The Bath Iron Works bid on their own plans and had a fight for it to get certain details of them accepted. Their boats were smaller than the others and were built on different plans, and they were the most successful and were very nearly the most costly per ton of displacement.

Mr. KITCHIN. They just took them in groups, two and three and one?

Mr. DUNN. The act of Congress provided that not more than a certain number of torpedo boats and a certain number of destroyers should be given to any one firm, the object being, evidently——

Mr. KITCHIN. To get the work done quickly?

Mr. DUNN. Partly to get the work done quickly, and partly to give a lot of yards experience in building such boats, so that there would be competition in the future. Only a few yards had been building them previously, and they did not want to be limited to the Bath Iron Works and one or two others for their torpedo boats.

Mr. KITCHIN. Do you know which one of these yards had built torpedo boats before?

Mr. DUNN. I shall have occasion to go into that in a very short time. I think it is of the greatest importance. But before I do that I want to state a fundamental proposition. You will see that the contract price was a certain amount, and the actual cost was away up in the air above it. Now, is that because the cost was too high or because the contract prices were too low? If this were a case where the contract prices were reasonable and normal prices at the time, and abnormal conditions caused an abnormal cost—that is, a cost that would not be expected to be repeated, that does not represent the ordinary fair value of such boats——

The CHAIRMAN. I know, but when contractors take a contract do they not assume that risk?

Mr. DUNN. I think they do. May I just finish what I was saying?

The CHAIRMAN. Certainly.

Mr. DUNN. I say, if this were a case where ordinary proper prices were made, and certain conditions, of which the contractors took the risk, abnormally increased the cost, then *prima facie* the contractors ought to stand the loss. But if this is a case where the cost was a fair, ordinary, normal proper cost for the product and the bids were utterly inadequate, representing prices at which such boats could never have been built at any time in any country, the claim of the builders presents a very different question. Now, mainly we have here the latter situation. There were certain elements representing a small figure in the actual cost of these boats that were due to a rise in the price of material and labor, which was a risk the contractors took, and

there were some elements doubtless, in the cases of individual contractors, due to some mistakes of their own; but the prices fixed by the Ramsay Board, which are far less than what the boats cost the contractors, were as low prices as those boats could ever have been built for in any country at any time. The prices so fixed represent a very conservative estimate of the fair value of the boats when they were completed, and what the Government has paid for the boats is much less than they are worth. It is the contract prices that were wrong, inadequate prices rather than excessive cost. That fact being understood, we must next inquire how it happened and whose fault it was that such inadequate prices were fixed, prices at which, if every condition had remained just as it was, it would have been impossible to build such boats.

Mr. KITCHIN. I understood you to say that when a contractor took a contract the price was normal and it was a normal and fair price.

Mr. DUNN. I beg your pardon; that is just what I did not say. I said that the question which was to be asked was whether that was the case, or whether, on the contrary, the cost was normal and the price abnormally low. Now, I have just tried to answer that question.

Mr. WALDO. It is all shown in the evidence that was before us?

Mr. DUNN. Yes, sir; it is all shown in the evidence, including in that term the papers, reports, etc., embraced in Senate Document 112, Fifty-eighth Congress, second session, and those submitted to this committee and the Senate committee in 1904.

Mr. WALDO. Do you remember what the price per ton was on the original estimate?

Mr. DUNN. We have some interesting evidence here on just that point.

Mr. KITCHIN. I tell you what bothers me in this matter, and I want you to explain it. It looks to me like when the Government appropriated this amount of money and let out these bids all your ship-builders got together and said, "The Government has appropriated so many million dollars, and we will go in and bid and just take it all." It looks to me like all of these fellows, instead of having a real competitive bidding, pooled together; and the nearness of the prices of all of them to each other convinces me that they had a pool, or that those prices are bound to have been normal, because each one of these ten or twelve boat-building concerns could not have figured it out to a cent and their prices so approximated the prices of the other bidders. Now, it is either one or the other, it strikes me.

Mr. DUNN. I want to answer that question. The price of the William R. Trigg Company, the lowest on the torpedo boats, was \$129,750, and the bid of the Columbian Iron works was \$168,000.

Mr. KITCHIN. As I remember, it was the Trigg man who said that was about the size of the situation; that they thought the Government had appropriated enough to do it, and they came in and bid the government price.

Mr. WALDO. They bid below the government price; that is the trouble.

Mr. DUNN. Below the government appropriation? I am coming in a moment to the way in which they made up their estimates; they certainly didn't figure it out to a cent, because they couldn't.

Mr. HAWLEY. Those two bids you referred to a moment ago, were they on the same kind of boat?

Mr. DUNN. On the same kind of boat, exactly.

Mr. KITCHIN. I do not think they had had much experience in bidding. These other boat fellows had had a lot of experience with the Government, and it did not look like the Trigg Company went into that field.

Mr. DUNN. Leaving out the Trigg Company, the bids still vary from \$146,000 to \$168,000. There is not a particle of evidence that has ever been unearthed by the naval bureaus, or by the Ramsay Board, or the committee that was sent around to examine these boats when building, of any combination between builders. If they had combined they certainly would have bid practically the upset price of the Government instead of large sums under it. There is a considerable variation in the bids on both types of boats. There was in fact no combination whatever. They did bid, each of them separately, as near the upset price as they dared, and I shall presently tell you why.

Mr. KITCHIN. If the contract price that they bid—the price that they bid—was not a reasonable price, will you please explain why their prices are so near together as all of them are?

Mr. DUNN. May I postpone that a little bit? I'm coming to that very point, which is an important one.

Mr. KITCHIN. Very well.

Mr. DUNN. I am going into detail as to just how they fixed the prices that they bid. First, however, I want to show some of the figures that were asked for by another gentleman here in support of what I have said about the actual cost of these boats. Take first the torpedo boats. The average contract price (with extras) compared with the average contract displacement gives a cost per ton of displacement of \$948. That is the contract price. The Government's upset price and limit of displacement gave a cost per ton of displacement of \$1,000. The fair average cost, as determined by the Ramsay Board after visiting a great many of these works and cross-examining and going into this thing carefully, was \$1,180 per ton of actual displacement, and the average actual cost was \$1,329. The contract price was \$948. It never could have been done for that in the world, anywhere. The limit allowed by the Government in its upset price, taking its limit of displacement, was \$1,000.

Mr. WALDO. One thousand and thirty dollars, was it not?

Mr. DUNN. If you take the low limit, I think it might come to that. If you take the high limit, which I took because even that was found to be an inadequate limit for these boats, it is \$1,000. The advertisement was for a displacement not to exceed 170 tons, and the upset price was \$170,000. The Ramsay Board's figures, taken in connection with the average actual displacement, give \$1,180, and the average actual cost was \$1,329.

The contract price of the most successful torpedo boats ever built before this, the *Dahlgren* and the *Craven*, built by the Bath Iron Works at a small loss—and that is not included in this bill—was \$1,325 per ton of displacement. The actual cost of the torpedo boats built under this act of 1898 by the Bath Iron Works, who had the advantage of obtaining plans from the leading French builder, and

more previous experience than anybody else, and who got the best results, was \$1,369 per ton of displacement.

The Ramsay Board asked the Bureaus of Engineering and Equipment, in the light of the experience they had gained from the actual working out of the designs for the machinery and equipment of these boats, to furnish an estimate—not based on any inquiry into the actual costs, but on what they knew of the conditions and needs—an estimate of the proper cost of the machinery and equipment for these torpedo boats. That estimate, as furnished by the bureaus, totaled \$116,375. That does not include the installation of outfit, any part of the hull and hull fittings, or any allowance for trials. By comparison with the actual cost of a great many of these boats I find that the equipment and the machinery, which are the two things on which the bureaus gave estimates, represent generally less and hardly ever more than half of the total cost. In other words, taking that proportion as correct—and it runs pretty close to that—you would have from the bureaus' estimates a total cost of \$232,000 for each torpedo boat, against the Ramsay Board's fair average cost of \$224,300 and an actual average cost of \$252,685.

In the case of the destroyers there is still more evidence available as to the actual cost being a proper normal cost. The contract price (with extras) per ton of contract displacement was \$685. The upset price, taking the largest displacement the Government allowed, was \$678 per ton of displacement. The Ramsay Board says the fair average cost was \$374,200, which is \$803 per ton of actual displacement. The average actual cost was \$883 per ton of displacement; and an expert on English torpedo-boat destroyer construction who testified before the House Committee on Naval Affairs before this bill came up, and whose testimony is attached at the end of the House hearings in 1904, said that for building 275-ton destroyers the Englishmen always got \$290,000, which is \$1,054 per ton of displacement.

Mr. KITCHIN. Were these of the same speed?

Mr. DUNN. They were of somewhat higher speed, but of much less exacting requirements as to the equipment, fittings, habitability, and so forth, which much more than offset it. I shall come to that later. About the time these boats were built the Englishmen had increased the size of their boats and were building boats from 300 tons up, some nearly 400 tons. Mr. Bowles made an investigation of the actual cost per ton of these boats, and it was \$894 per ton, as against the Ramsay Board's report here of \$803 per ton. Now, of course, the smaller the boat the larger the cost per ton of displacement, so that \$803 per ton as fixed by the Ramsay Board for a 466-ton boat is not so very much under \$894 per ton for a 300 or 340 or 350 ton boat; but certainly, on the whole, carrying the usual proportion, it indicates a lower cost than that fixed by the Englishmen. On the other hand, the English 275-ton destroyers that Mr. Platt testified about before the committee, being much larger than our torpedo boats, ought to have cost considerably less per ton of displacement. According to his figures they were costing \$1,054 per ton of displacement, while the contracts for our torpedo boats were only \$948, with an upset price of \$1,000, per ton of maximum displacement. They were building boats nearly twice as large over there and paying more per ton of displacement for them. I will say that the actual trial displacement of these boats is

given on pages 11 and 12 of the hearing before the Senate Committee on February 25, 1904. There are some tables in the evidence which have columns for displacement and cost per ton, but they give contract displacement and not actual displacement.

Now, the bureau estimates on the machinery and equipment for the torpedo-boat destroyers, as furnished to the Ramsay Board, representing the proper cost of those items with no allowance for hull or fittings or trials, amounted to \$218,722, as compared with the average contract price of \$286,689. You see that the general expense and the trials would have used up the difference between the two figures and left nothing for the hull. Taking the proportion I find runs through the figures, it seems that equipment and machinery are about half of the actual cost. Those estimates then would indicate a total cost of \$437,000, as against the Ramsay Board's figures of \$374,000 and the actual cost of \$411,000, so that apparently the estimates of the bureaus as to what the machinery and equipment ought to cost were considerably bettered in actual experience in these boats.

The last destroyers authorized by the Government, which are now building, are 740-ton boats; they are much larger than these boats, which average 466 tons. They ought, therefore, to be costing considerably less per ton of displacement. As a matter of fact, while the contract price of the boats in this bill was \$685, and the price you are now asked to pay is \$803, and the actual cost was \$883, for these much larger boats, the Government is now paying an average contract price of \$865 per ton of displacement.

Mr. WALDO. Right there let me ask you what, if any, difference is there in the cost of material at this time and at the date when those boats were built?

Mr. DUNN. That, of course, is a question that would have some bearing upon it. I have not investigated it.

Mr. WALDO. Some of these builders here ought to know.

Mr. DUNN. There are three or four of the builders present. Can you tell what the present prices of the kinds of materials that go into these boats are, compared with the prices that prevailed at the time of the building of these boats? I know there is not a gentleman present who would touch one of these boats now with a 40-foot pole.

Mr. SMITH. Forgings would not be as high now.

Mr. DUNN. How about the hull plates?

Mr. SEABURY. There is not very much difference in those.

Mr. DUNN. When you say the forgings would not be as high, you refer to those final prices, \$2.36 a pound, that they got up to before you got through.

Mr. KITCHIN. These boats they are building now are a great deal faster?

Mr. SEABURY. Not in proportion.

Mr. KITCHIN. How many knots?

Mr. SEABURY. The destroyers built under the act of 1898 had a minimum requirement of 28 knots. Some of them made 29.

Mr. DUNN. What are the new ones to make?

Mr. SEABURY. Some of them run 28 and some of them 30.

Mr. DUNN. And they are very much larger boats, which ought to make a higher speed.

Now, that matter also has been covered by the report of the Navy Department. There was a letter presented to the committee at the

last hearing from Mr. Morton, the Secretary, saying that they considered the prices it was proposed to pay for these boats to be fair compensation for the boats. The Bureaus of Construction and of Steam Engineering so reported in approving the report of the Ramsay Board, and it is the universal effect of all the department papers on this matter.

I have made that general statement, that the prices you are asked to pay are nothing but the fair normal prices for these boats; that we are not asking you to allow for the things we ought to have taken the risk of; for some artificial running up of the prices of materials which represented a very small percentage of the total cost to us; for some increase in the price of labor due to the particularly heavy demand for labor; for certain costs of that sort. When I say that, I have perfectly in mind that the Ramsay Board in making its finding was not directed to draw its line in that particular direction. In other words, it was not directed to find what the actual cost had been and what it would have been at the prices for materials which prevailed at the beginning of the contracts. Such an investigation could be made, of course, if the committee thought it proper, but as the Ramsay Board did omit from its figures some very important items of cost that were not conditions that the builders should have taken chances on, and as the prices which it is now proposed to pay are somewhere around a million dollars less than the total cost of these boats, I think the committee will be satisfied from an examination of all the evidence that the figures set by the Ramsay Board are less, rather than more, than the normal cost of these boats; and that if in any items the actual cost was a little higher than it ought to have been under normal conditions, that excess is not included—nor any part of it—in the sums that it is now proposed to pay.

I have stated that the trouble was principally that the prices were lower than such boats as were ultimately constructed could ever have been built for at any time in any country. That is a conclusion that of course I draw from the papers and evidence before the committee, and I have supported it by figures taken from those papers, and by the opinion officially expressed by the department.

I want to recall briefly the investigations that have been made. In November, 1901, while the boats were under construction, two naval officers, Messrs. Linnard and Chandler, were directed to visit all the yards on the Atlantic coast and make a report on the boats under construction, and they went into this matter of the losses of the builders. A joint report was made by the Bureau of Construction and the Bureau of Steam Engineering on the same point. The Ramsay Board, with Admiral Ramsay at its head, was appointed to visit the various yards and take evidence of all kinds and examine books and papers, and report. They did so, and their report was approved by the Navy Department and was sent to Congress by Secretary Long with a recommendation for relief. There have since been presented to the committee letters from Admiral Melville and from Secretary Morton, and there have been elaborate hearings where evidence was taken before this committee in the previous Congress and before the Senate committee, the evidence being all in the hands of this committee. In fact, the matter has been investigated by almost everybody except the Secret Service, and if Congress

is not willing to act on anything except a report of the Secret Service in this matter, we are willing to court such an investigation.

I shall not have time here to read at length from the evidence in support of every statement I shall make. If there is any statement that any member of the committee wants to have supported, I think I can turn to the evidence to support it.

The CHAIRMAN. There is one matter I want you to call the attention of the committee to before you get through. I want to know whether your companies or any of them claim that any of this loss was occasioned by the fault of the Government in any respect?

Mr. DUNN. We certainly do. I shall come to that before we close.

The CHAIRMAN. I would like to have you point out to the committee in what that fault consists.

Mr. DUNN. That is one of the main heads that I want to cover, and cover just as clearly as I can. The trouble is that it is nearly 12 o'clock now, and how I can possibly say all that I want to I do not know.

Mr. KITCHIN. I suggest that you write a brief and put it in the record. Every member of the committee will read your brief, as every member of the committee read this statement.

The CHAIRMAN. I have read everything but that.

Mr. KITCHIN. I have read the hearings and the Senate document and the hearings here.

Mr. DUNN. I could not make a better brief than this "Statement of the builders." It is a fair, complete, and clear statement of the facts as deduced from the evidence. It cannot be condensed any more and can not be any better stated. I do not believe I could improve on it.

Mr. KITCHIN. There is one thing that I forgot to ask you. I believe you represent the Bath Iron Works?

Mr. DUNN. Yes, sir.

Mr. KITCHIN. How long had the Bath Iron Works been building ships for the Government before these contracts?

Mr. DUNN. I think I have that information right here. They had been building government vessels for a number of years.

Mr. SMITH. Not torpedo boats?

Mr. DUNN. Not torpedo boats; no, sir. I want to answer Mr. Kitchin's question.

Mr. KITCHIN. I want to see how many times they have been back here asking Congress for appropriations to make up losses. Take George Lawley & Sons; they had been building for the Government before, had they not?

Mr. DUNN. That was their first and last government contract.

Mr. KITCHIN. And their last?

Mr. DUNN. Their first and their last.

Mr. KITCHIN. All right. Lewis Nixon had been building, all right, had he not?

Mr. DUNN. They had built a monitor and a cruiser.

Mr. KITCHIN. The Trigg Company; I know they had not been building government ships.

Mr. DUNN. Mr. Trigg had built the engines for the battle ship *Texas*; that was all the experience he had.

Mr. KITCHIN. The Columbian Iron Works, how about them?

Mr. DUNN. The Columbian Iron Works had done the *Detroit* and the *Montgomery*, cruisers.

Mr. KITCHIN. How about the Gas Engine and Power Company?

Mr. SEABURY. They had one boat, not completed.

Mr. KITCHIN. How about Neafie & Levy?

Mr. DUNN. They had built tugboats, but not torpedo boats. I do not know whether they had built any tugboats for the Government.

Mr. KITCHIN. How about the Harlan & Hollingsworth Company?

Mr. SMITH. They had not done anything since building the double-turreted monitor the *Amphitrite*.

Mr. KITCHIN. They had built some, had they not?

Mr. SMITH. Not since 1876.

Mr. KITCHIN. How about the Fore River Ship and Engine Company?

Mr. DUNN. They had for three or four years been building small boats, commercial boats, but I do not believe they had built any government boats.

Mr. KITCHIN. And how about the Union Iron Works?

Mr. MYERS. The Fore River Ship and Engine Company was a new concern and had not built many boats for the Government or anybody else.

Mr. KITCHIN. There had been a reorganization of the old company. Had not the same men been in the boat business before?

Mr. DUNN. I can answer that, because I got these data from Mr. Bowles. The old company has since been reorganized at a large loss because of what they got stuck on this contract, but the old company had been going only a short time before these contracts were taken, and they had done no government work. They had built several small commercial vessels.

Mr. KITCHIN. Had not the managers of the old Fore River Company been in a company that had built boats for the Government before that?

Mr. DUNN. No, sir.

Mr. KITCHIN. How about the Maryland Steel Company?

Mr. DUNN. They had built commercial boats only.

Mr. KITCHIN. That is what I wanted. Those companies had been building boats for the Government; and had they not been coming back here asking the Government for losses, heretofore?

Mr. DUNN. Five of the eleven had never had a government contract, and the sixth company had not completed its first one. The other five had not asked for relief before.

Mr. KITCHIN. No, I do not think they had come, either. They had been making big profits on the Government. Now are they going to divide with the Government the big profits that they made on their other contracts?

Mr. DUNN. The Government does not intend that the builders who do work for it shall not make a fair profit.

Mr. KITCHIN. Is it fair to make a loss in one case and ask the Government to make it good, and at the same time not divide the big profits that they have been making in many other cases?

Mr. DUNN. There is no evidence of their making excessive profits on any work they had done for the Government before. They had made only fair profits, and in some cases losses, for which they did not ask relief because there were not the same equities.

Mr. SMITH. The navy has been built up at the expense of the shipbuilders.

Mr. KITCHIN. I am sort of like Mr. Myers in his testimony before; I always had an idea that a government contract was about the best thing in this world, especially a naval contract.

Mr. CROWTHER. The Neafie & Levy Company lost \$600,000 on one contract.

Mr. DUNN. The first modern battle ships that were built ruined John Roach.

Mr. KITCHIN. My first recollection in Congress is of his coming back for the money.

Mr. DUNN. Yes; and he got a very small proportion of his loss.

Mr. SMITH. It killed him, too.

Mr. DUNN. It ruined him, and killed him. Only two of the concerns that took these contracts—two whose plant isn't adapted for anything else—would look at a government contract over their shoulder now.

Mr. KITCHIN. I am glad to hear it. I am glad to hear that we have one department of the Government that can make a good contract.

Mr. MYERS. No shipbuilder wants a government contract now.

Mr. DUNN. It isn't a desirable condition to have most of the shipbuilders of the country unwilling to take naval contracts. It wouldn't be desirable in a time of sudden need.

Now, I want to answer your question as to how it happened that they bid just as they did. Those who had built government vessels before this were just so much worse off than those who had no government experience till they took these contracts. The building of these special types of vessels to make these high speeds with these very light weights is about as much like building cruisers as building a flying machine is like building a locomotive. The engine has to develop the same horsepower as the engine in a battle ship, and it can be only half the weight. Every particular line and angle and plate and shape and forging has to be according to new special designs and made out of new special material, to come anywhere near getting the required speed and the other required conditions. When these contracts were advertised for, the Government submitted four or five general outline plans. There were practically no drawings whatever, whereas there had to be later prepared by one contractor 886 detailed drawings, prepared and submitted to the department, and many of them rejected and made over again. They had no data, therefore, to decide on the forgings, angles, plates, and so forth. The specifications as to almost everything said "shall be fitted as directed," "shall be adjusted as directed by the superintending naval constructor," "shall be of such and such a weight, but additional weight may be required," "to be furnished as directed," "additional frames may be put in here if directed."

Mr. TIRRELL. Are you speaking about the contracts for these boats?

Mr. DUNN. Yes.

Mr. TIRRELL. If the Government under these contracts had insisted upon changes being made in regard to all these things that were authorized in the contracts, could anyone build such a boat without being ruined?

Mr. DUNN. No, sir. Now, this being true, the builders looked over those outline plans and found that the plans gave them no definite information as to the amount that would be required of each kind of material and the amount of work that would be involved. When a contractor is bidding on a type of boat, substantially similar throughout to vessels he has built before, or even substantially similar to vessels built by other contractors, whose complete plans and drawings are on file where they can be examined, he has something to go by. He knows what it has cost him, or approximately what it has cost other builders to build such boats before. Or, if he is bidding on a new type of boat, and has detailed drawings of every part with detailed specifications, he can submit those drawings to the manufacturers of plates and forgings, etc., and get estimates, at least, if not options on the material, and figure up with substantial accuracy the amount of labor involved. In this case the contractors had nothing on which to base any detailed figures. One contractor testified that it was a year's work for 50 draftsmen to make the drawings required for the boats built by that company. The builders had less than 60 days to prepare their bids; they could not get options, nor even definite estimates from the manufacturing companies for most of the material, because the manufacturers said: "Send us your drawings and we will figure the cost of making the material." The drawings could not be furnished, and so it was possible to get options on only a very small part of the material. The cost of making forgings depended very largely on the shape, character, and design of the forging, and without knowing that, no figure could be obtained in advance. It was as if a man said to a contractor, "What will you ask to build me a house 40 by 25 feet, and two stories high, with brick walls and finished inside in various kinds of wood, as I shall specify?" The contractor would say, "Show me your detailed plans and specifications." Then suppose the owner replied, "I shall work those out as we go along." No contractor could make a reasonably accurate bid under such circumstances. As a practical matter, what these shipbuilders knew about the prices of earlier boats of different types was practically all they had to go by, and that was misleading. For instance, Mr. Hyde, of the Bath Iron Works, testified he knew about how much per ton of displacement larger boats cost, and it certainly looked to him as though a thousand dollars a ton was enough, and it looked so to anybody; but it was not.

Mr. KITCHIN: Some of these concerns had built such boats?

Mr. DUNN. Just one of them, the Columbia Iron Works, had completed some torpedo boats, but of very different requirements.

Mr. KITCHIN. And they got people to go over to England and France and get plans?

Mr. DUNN. That was the Bath Iron Works. They went to France but they could form no opinion as to the cost from what they got over there, because the cost of the wages, on the one hand, and the efficiency of the workmen, on the other, was so different that they could get no comparisons of cost.

Mr. KITCHIN. One of them testified that although they paid the American workman higher, and there was a difference in the experience, yet his efficiency counterbalanced the difference in price.

Mr. DUNN. That may have been eventually discovered, but it could be learned only from experience. They couldn't tell in advance how the labor cost would compare.

Mr. KITCHIN. And he had worked in the yards.

Mr. DUNN. There was no testimony that the relation you spoke of between labor cost and efficiency was known to any of the builders beforehand.

Mr. KITCHIN. I mean about the labor.

Mr. DUNN. It was Mr. Hyde who testified himself that he could not judge anything from the French prices.

Now, as to the boats that had been previously completed; that is one of the matters of the utmost importance. The only high-speed boats that had been previously completed were boats where the Government had said to the builder, "Build a boat of about such a size to make such a speed." In some cases there were no specifications at all and no instructions. The builder was given the speed and he built the boats with that speed, but when the Government got them they found two things; first, that the hulls were not strong enough to be seaworthy and stand service and they had to strengthen them; and, in the second place, there was practically no equipment and no adequate provision for either carrying capacity or comfort or habitability or convenience, and therefore in these new boats they increased all those requirements.

Now, when you get to delicate problems like this, where every pound of weight immensely increases the power you have got to put in to get your speed, nobody can tell in advance how much difference it is going to make to add thirty or forty tons for the habitability and carrying capacity and such things, and the result was that those who know the most about previous torpedo boats of different types were those who were most misled, in thinking that the price allowed under these contracts was a fair price. As a matter of fact, they figured on what they knew to be usual about the cost per pound of hull and per horsepower of machinery and cost per ton of displacement—and that is what the department had done—and these things all came out far below the upset price. They talked with the government people who said, "Yes, there is plenty of money allowed there," and then they bid as close to the upset prices as they dared. Of course they did. They wanted to protect themselves as far as they could, and at the same time they wanted to get the contracts. Now, Admiral Melville's letter which is before the committee says expressly that he did tell Mr. Trigg that these boats could be built for less than the estimates, and that that was the general information given out at the department. It had always been customary for the Navy Department to study these things and work at them, and it had always been customary for the builders to come on here and talk them over with the department and get their estimates, and they had always found those estimates were reliable. So it happened here, especially as they knew nothing about it themselves. Those who had boats under construction had not gone far enough to get accurate information as to cost, and most of the boats were far inferior in their requirements to these; so they went to the Navy Department and said, "As near as we can calculate, these upset prices ought to be large enough; what do you think about it?" The Navy Department said, "Yes, there is lots of room there."

The CHAIRMAN. Was it not within the power of these people who made these contracts to get this information themselves from the French Government; or they might have gotten the English prices? Why could they not have gotten the plans from the French Govern-

ment by sending an agent, a secret-service agent, for instance, over there to get them?

Mr. DUNN. They could have bought them. They had less than two months to do it.

Mr. MYERS. They had not time enough.

Mr. DUNN. They could have bought them for a large sum of money, as the Bath Iron Works did.

The CHAIRMAN. Is it not true that the department made every extension of time and every concession as to the speed and that every concession in every way that was asked by the contractors was granted by the Navy Department?

Mr. DUNN. That is true.

The CHAIRMAN. Then it is not fair, possibly, to say that they did not have time to find it out.

Mr. DUNN. No; I mean to say before making their bids—they had no extension of time then; that is what I am talking about.

Mr. KITCHIN. Mr. Hyde was the president of your company, the Bath Iron Works?

Mr. DUNN. Yes.

Mr. KITCHIN. I want to say that he impressed me as being candid and fair and honest in his statement, and impressed me as knowing as much about this matter as any man, or more than any other man, who appeared before our committee. I recall that he said that the reason for their loss was that there was a certain combination on these materials.

Mr. DUNN. I would like to read you just what he said.

Mr. KITCHIN. If you will turn to page 56 of these hearings you will find the following:

Mr. KITCHIN. Do you think, if there had been open, free, and fair competition among steel plants and the material plants, that your company could have built these ships within the contract price, or practically within the contract price?

Mr. HYDE. Yes, sir.

Mr. KITCHIN. Could have built them a great deal cheaper?

Mr. HYDE. Yes, sir.

Mr. KITCHIN. I meant by the free and open competition, in America here, among steel plants and material plants.

He answers yes. So that his idea then was that the material fellow was the one that dug the shipbuilders. I have always been very much impressed with this claim, but I have always seen that they had some equity, and I tell you you never have pressed it. I will tell you now, it strikes me the only equity you have—I do not know how it strikes anybody else, but none of your lawyers or shipbuilders have ever pressed it—is this. If Mr. Hyde's testimony be true that it was the material fellow that caused the loss, there being no competition on the material, if Congress went out and made contracts compelling shipbuilders to buy from these steel men and from American manufacturers, knowing that there was a monopoly and a trust, or so that they could form a monopoly and a trust, it strikes me that the only equity you have got is because you were compelled to buy from American manufacturers of material, and the price went up from 62 cents to \$1.68. That is the only equity you have got.

Mr. DUNN. I think there is force in that; but we have several stronger equities than that.

Mr. KITCHIN. If Mr. Hyde's testimony is correct, I do not see it.

Mr. DUNN. Mr. Hyde himself says, on page 46 of the hearings before the Senate committee, that the cost of the material, a 50 per cent rise in the cost of material, was a small element in the loss on these boats.

Mr. KITCHIN. Let me call your attention to another thing. The testimony was, and Mr. Hyde joined in it, that their great loss was not so much from the cost of material going up; that they could have stood that, perhaps—a little loss—but it was because the steel companies had a monopoly and you had to buy from them and nobody else, and instead of delivering the stuff in six months to eighteen months they kept the shipbuilders three years, and took their whole plant that they had to build these boats and kept it idle.

Mr. DUNN. That was a very large element, but, as I said at the beginning, that increase is not in this bill.

Mr. KITCHIN. He says that was the cause of their losses.

Mr. DUNN. It was the cause of a big loss that is not even figured in here.

Mr. KITCHIN. And I suggested to some of them, Why not sue the steel companies? Some of them said jocularly, "You had better not fool with them. You have got to build boats and you have got to buy material from them."

Mr. DUNN. Most of them had no cause of action against the steel companies. To most of them the steel companies said, "We will not quote you any price or any date of delivery. That is the most difficult material we have ever had to tackle, and when we get it all made your government inspectors reject it, and we will not give you prices until we get the drawings, and we will not guarantee you delivery at any time."

Mr. MYERS. That is a fact, and a very important fact.

Mr. DUNN. The amount recoverable under actions on contract against those steel men would not represent 3 per cent of the losses of all these builders.

Mr. KITCHIN. Mr. Hyde, then, did not know what he was talking about? He was your vice-president.

Mr. DUNN. Mr. Hyde himself says that the cost of the material was a small item. You just now quoted him to that effect.

Mr. KITCHIN. But does not the testimony show that the losses were because of the delays?

Mr. DUNN. I want to make that clear. The loss we are asking for now does not include those losses by delay. We lost immensely in that way, but we have not figured those losses in, although I think we ought to have done so. The losses we are talking about here are losses besides those. But as to the matter of suing the steel companies, my point is that except perhaps in a few instances there was no legal cause of action, because the steel companies refused to bind themselves to any fixed time.

The CHAIRMAN. Then there will be an extra claim on account of delay, since Mr. Kitchin has called attention to it?

Mr. KITCHIN. I just stated what Mr. Hyde said. There are two items here. One is labor and the other is material. That is all there is in boat building, and included in that is the general expense.

Mr. DUNN. Yes.

Mr. KITCHIN. Mr. Hyde certainly explained it is not for labor. Turn to page 57. Mr. Hyde says he spent six or seven months in visiting these plants. He says as follows:

Mr. HYDE. I think Monsieur Normand, with whom I associated in France, could build a boat such as that in sixteen or eighteen months.

Mr. McNARY. He could build it for how much less in price? Would it cost him as much or less?

Mr. HYDE. His labor per day or per hour is about 50 per cent of what ours is, and material about the same ratio. That is largely made up for by the fact that our labor is much more productive than theirs.

Mr. McNARY. You think the labor is more productive?

Mr. HYDE. Yes, sir; I know it is. I spent several months in his plant, and I know it.

Then he went on to speak of the material delivered, duty paid. He was offered from German steel plants this forged steel at 62 cents, duty paid, in New York; and yet the steel trust made them pay \$1.68 at their plant.

Mr. TIRRELL. In other words, without any duty at all, the difference in capacity of the laborers in our country would have made up the difference in the cost; a most absurd proposition.

The CHAIRMAN. The members of the committee will argue this out afterwards. We want to have the hearing now.

Mr. DUNN. The questions just asked as to where the trouble was, whether in the materials or the labor or somewhere else, indicate the assumption that the cause of the loss is an excessive cost, which we have to explain. Now, as I hope to show you later, there were some elements of excessive cost in the construction of these boats, and for the largest of those elements, namely, the delay in construction and the cost of trials, the Government was to a large extent directly responsible; but if all of those elements of excessive cost had been eliminated, the builders would still have had a very heavy loss. The principal cause of their loss, as I have been trying to explain, was not excessive cost at all, but utterly inadequate bids, and the compensation asked for in the pending bill would no more than cover the normal, ordinary cost of such boats as these were when finally completed, if they had been built under the conditions prevailing when the contracts were let, without any rise in the price of materials and labor, and with the designs, drawings, and calculations all correctly worked out. The principal trouble was that, when they came to work out the drawings, designs, and calculations, and the miscellaneous requirements for equipment, carrying capacity, convenience, comfort, and habitability, the effect of all these requirements, combined with the speed and strength requirements, was to present a problem much more difficult than was presented by any boats previously constructed, and boats answering all those requirements could not possibly be built here or elsewhere in 1898 or at any other time for any such price as the department allowed or the contracts called for.

Our first and largest equity, therefore, is that in many particulars the Government did not tell us when we made our bids what the requirements would be, and in the few particulars in which the specifications were definite, such as horsepower and displacement, they proved to be erroneous; that we had no data on which we could prepare any accurate estimates or obtain accurate estimates from material men; that the Government had undertaken to calculate the cost, and at least knew better than we what requirements it had in mind in all the particulars in which the specifications were indefinite;

that the government officials undertook to assure the contractors, as a result of their study of the subject and the calculations they had made, that the upset prices left plenty of margin; and that as a practical matter the bidders had to rely on those assurances and the government estimates (having found such estimates reliable in the past), because there was nothing else they could rely on. In a word, the Navy Department, being itself mistaken, honestly but nevertheless disastrously misled the contractors, and its miscalculations were chiefly responsible for the wholly inadequate bids.

Having induced a lot of contractors, many of them with no previous experience in government work, and none of them with any experience sufficient to aid them materially on this problem, to bid such inadequate prices, there were only two things the Government could fairly and honorably do. One was to exercise their power of direction and supervision in such a way as to permit the construction of boats that could be built for prices somewhere near the contract prices, which would have meant less satisfactory and efficient vessels than these were when finally completed.

But the department did not chose to adopt that course. Instead it exacted the very highest excellence that the latest development of the art could furnish in all the materials of the boats; and in practically every one of the hundreds of details left to the discretion of the government inspectors, exercised that discretion in the most exacting fashion; and, having discovered its miscalculations as to displacement and horsepower, called upon the builders to correct its errors at their own expense, with only a slight modification of the speed requirements made necessary to permit the other requirements to be fulfilled, with the result that first-class boats were built, but at a cost necessarily way above the contract prices. Under those circumstances, the fair and honorable thing for the Government to do is, in our opinion, to pay the builders what the work as finally done was fairly worth.

Now, may I answer the question of the chairman as to just what the Government did to increase the cost of these boats?

The CHAIRMAN. Certainly.

Mr. DUNN. In the first place, the Government made its calculations in advance. It was studying this subject. It had studied the subject more than any of these builders. It made these calculations in advance on the displacement of the boats and the speed to be attained, and it absolutely limited the builders to a certain displacement. When they came to work it out they found that neither the original speed requirements nor the slightly modified speed requirements could be met, in connection with the other requirements as to strength and carrying capacity, equipment, comfort, convenience, and habitability, without largely exceeding both the original limits of displacement and the original calculations for horsepower of engines. This meant a large amount of additional expensive material, which the builders had to furnish and pay for; new and improved designs for the engines, involving the doing of a great deal of work twice; long delay while the problem was being worked out, and a great many expensive trials. That miscalculation is one of the things the Government did that increased the cost.

The CHAIRMAN. The Government of the United States has received the benefit from these people, but the Government, on the other hand, has done everything possible and not held them to their contract at

all, and granted them concessions of time and concessions of speed. I think the Government has granted every request that has been made for a concession.

Mr. DUNN. Every one except the one we are making now, and the department recommends the granting of that one.

Mr. KITCHIN. The Bath Iron Works have been making these torpedo boats and torpedo-boat destroyers for the Government since, have they not?

Mr. DUNN. They have some of the new lot.

Mr. KITCHIN. And some of those other companies also?

Mr. DUNN. The only other one is the Fore River Company.

Mr. KITCHIN. You said they were paying a great deal higher price now for these bigger boats they are building than they did then. Do you not reckon they are going to get some of their loss back on the profits on these boats, on these prices?

Mr. DUNN. That couldn't be said of any but those two. But I think the Navy Department can be trusted to take care of itself there. The builders hope, of course, to make a reasonable profit, but they may repeat their past experience before they are through.

Mr. KITCHIN. I think they made a good contract. There is no doubt about it.

Mr. DUNN. I never yet found a man who made much money out of a government contract.

Mr. HACKETT. You mean a contract for building for the Navy Department?

Mr. DUNN. No; for half a dozen other departments.

Mr. KITCHIN. How would the Fore River Engine Company live if they did not get government contracts?

Mr. DUNN. That is what their business is adapted for.

(At 12.30 o'clock p. m. the committee took a recess until 3.30 o'clock p. m.)

AFTERNOON SESSION.

COMMITTEE ON CLAIMS, HOUSE OF REPRESENTATIVES, *Tuesday, January 19, 1909.*

The committee reconvened at 3.30 o'clock p. m., Hon. James M. Miller (chairman) presiding.

ARGUMENT OF HENRY W. DUNN, ESQ., OF BOSTON, MASS.—Continued.

Mr. DUNN. I want to make a very careful statement, which I will make as brief as I can, of exactly the conditions under which these contracts were let. I shall have to go into two or three phases of it, all of which are of vital importance.

In the first place, the experience with previous torpedo boats. Torpedo boats had been chiefly developed in France, and torpedo-boat destroyers chiefly in England. As stated in the report of Messrs. Linnard and Chandler, who were sent around to investigate these boats for the department, the building of torpedo boats of the highest practicable speed was an art requiring special skill and long experience, and there were comparatively few successful builders of torpedo boats in the world; and, as they go on to say, the attempt was

made in this country to rival the best results of foreign builders by manufacturers here who had practically no experience, and on designs prepared only in outline by the department, and not worked out in detail. Now, that statement requires some explanation of the difference between these boats and the so-called torpedo boats of which, as it already appears in the papers and tables here, quite a number had been built before.

The peculiarity, of course, of a torpedo boat is its small size and its speed, and up to a certain limit it maintains a reasonable proportion to other kinds of construction. That is to say, you take a large steam yacht and a small steam yacht, and the small steam yacht will cost more per ton of displacement, but not necessarily enormously more. The tendency of course is the larger the vessel the higher the speed which it can develop with comparative ease. As you go down, making your vessel smaller and smaller and still keeping up your speed, there is a certain point up to which you can do it with a certain difficulty. When you try to drive beyond that point, of course there is a limit that you can not possibly pass—that has not been passed yet. With anything of that kind the nearer you get to the absolute limit of speed for a vessel of that size, the more enormously you increase your expense. Finally you get to the point where you have got to have the most expensive materials. You have got to have the proper strength, and at the same time the greatest possible lightness. You have got to have everything designed with the utmost care; you have got to have your engines perfectly balanced so as not to cause excessive vibration of your hull; you have got to have your hull strengthened in a particular manner peculiar to that type of boat and only known by experience; and the problem becomes one of the utmost nicety in balancing those conditions.

In the boats that had been built up to the time these contracts were let, they had not reached that point of extreme difficulty except in certain ones that I will speak of. There had been small boats of 18 and 20 and perhaps more knots per hour speed, as compared with the 26 and 28 knots that were specified here, but matters had not been pushed quite to the point where extreme skill and nicety were required to obtain the speed. There were three torpedo boats which had been previously completed by one of the builders that bid for one of these, the *Columbian Iron Works*, who had built the *Foote*, the *Rodgers*, and the *Winslow*, which were 24 and 25 knots. Twenty-four and 25 knots was a less speed than was required by these contracts. There had also been built by another contractor the *Porter* and the *Dupont*, which had a speed comparable with these vessels. But in the working out of their contracts on these earlier boats, the builders had been left simply to get the contract speed on a boat of a certain size and the details had been left to them. The result was, of course, that they left out everything that would make for weight and did not help in speed so far as they possibly could. Speed was practically the only requirement of the contracts. The result was that when the *Porter* and the *Dupont* were finished and came to have their trials and go into service, they were found to be radically deficient in structural strength. I do not mean that they broke in two when they first went across the harbor, but the department found them extremely unsatisfactory, and changes in the direction of strengthening were made, and the lesson was remembered in superintending the building of these particular boats.

In the *Foote*, the *Rodgers*, and the *Winslow* the trouble was not so much deficient strength as that they had left out everything, almost, in the way of equipment and carrying capacity for coal and provisions, and arrangements for the comfort and convenience of the officers and crew. It is pretty hard work to get satisfactory crews for these boats anyway, they have to live in such narrow, cramped quarters. All the provisions for convenience, equipment, carrying capacity, habitability, had been neglected and pushed aside by the builders in order to get their contract speed.

With those lessons before them, the department in preparing the specifications for these boats expressly required a lot of things as to carrying capacity, equipment, convenience, comfort, and habitability which put these boats not only away ahead of the existing boats of this Government but ahead of the foreign boats. The same trouble was being found at the same time with the foreign boats. They found that the boats could make a dash on a trial trip, but they were not serviceable boats in service; they were not well enough equipped and not strong enough and did not have enough carrying capacity. Those same difficulties were found in foreign countries. So all those requirements in these boats were immensely increased. Now, the effect of that was to add tons to the weight in the boats without advancing in any way their strength of hull or speed; and when you had to drive all that extra dead weight at a higher speed than was required under the earlier contracts and make your hull sufficiently strong and get your engine sufficiently powerful, you reached that point where this problem became the one of extreme nicety that I have spoken of, that only the most thorough skill and repeated experimenting could possibly work out—something that could not be fully appreciated by the builders or the department at the time these contracts were let. There were boats building at the time these contracts were let, but they were not far enough along to furnish experience of value. There were four vessels, the *Farragut*, the *Stringham*, the *Goldsborough*, and the *Bailey*, about halfway between the torpedo boats and the torpedo-boat destroyers, which were to be 30-knot boats. They had been started before the lessons of the *Foote*, the *Rodgers*, the *Winslow*, the *Porter*, and the *Dupont* had been learned, and they also were inadequate in their fittings and equipment and carrying capacity, and so forth, and the builders were left more or less free to work out the result of speed in any way they could. Nevertheless, those boats when they were finally completed, which was after these contracts were let, emphasized very strongly the lessons which had already been learned by the department in the *Porter* and *Dupont* and the *Foote*, *Rodgers*, and *Winslow*.

Those four 30-knot boats which were building in 1898 showed entirely different results from the boats covered by this bill. The *Farragut* had great difficulty in fulfilling her contract requirements. She finally succeeded in making the required speed, but this was accompanied by excessive vibration, and the hull was so light as to be criticised by the department officials for insufficient strength. The *Stringham*, *Goldsborough*, and *Bailey* were even less successful. The *Goldsborough* repeatedly failed to make her speed, and her builders finally became involved in financial difficulties so that the Government was compelled to annul the contract and take over the boat

for completion. The *Stringham* never succeeded in making the required speed, and in 1905 had not yet been accepted. The *Bailey* was completed and accepted, but her speed had been accomplished at such a sacrifice of strength as to necessitate extensive alterations by the Government after a short experience in service. These changes undoubtedly resulted in reducing her speed considerably below 30 knots.

Those lessons which had already been learned from the fast boats built before 1898 were subsequently emphasized by the four boats then under construction, the *Farragut*, *Goldsborough*, *Stringham*, and *Bailey*, and that was the reason why the department put in these additional requirements, both as to strength and as to carrying capacity, convenience, and habitability, and all the rest of it. Now, to calculate exactly how much difficulty that would add to the problem of securing sufficient strength and sufficient speed was a matter of a great deal of difficulty. The department attempted to make such a calculation and it fixed on a displacement which it thought—that is, a total weight of vessel—which it thought would be sufficient for the strength required, and the horsepower of engine which it thought would be sufficient for the power required. The general length of the vessel and its general dimensions were defined, and some miscellaneous requirements for the equipment and carrying capacity, and so forth. Those and the displacement and the horsepower were the data furnished——

The CHAIRMAN. Were not these proper matters for consideration prior to entering into the contracts?

Mr. DUNN. I am coming to that in exactly that aspect, if the chairman pleases. Those things were the data given to these people to bid on. The Government had attempted to study out those problems in advance. No boats had been built in this country which would solve those problems; no boats had been built abroad which had comparable provisions in the matters of serviceability, carrying capacity, and so forth. These boats were a distinct advance on any foreign boats as well as on any American boats in these respects; and how far, as I say, that would affect the speed and strength problems was an abstract question of calculation. The Navy Department made these calculations and fixed on the horsepower of the engines, and the displacement, and the speed of the vessels, and those things were specified in the contract, and the bidders were not to bid on anything above the fixed displacement. Those things were offered to the contractors to bid on. The Columbian Iron Works had built the *McKee*, a low-speed boat, and the *Foote*, *Rodgers*, and *Winslow*, which differed from all these vessels in the respects I have enumerated. In those vessels the extra weight had been cut out. This added so enormously to the difficulty of the shipbuilder that their very experience with those boats was what most of all misled the Columbian Iron Works in making their bid. They said, "The upset price here will allow us a great deal more per ton than we got on the *Foote*, the *Rodgers*, and the *Winslow*. That must be enough to make up for the difference." It was a case of miscalculation on a problem that nobody had ever worked out by experience. They said, "The department has calculated these things, and we have always found the department perfectly reliable heretofore, and we have no estimates

of our own on which we can proceed." It was freely stated about the department that they had figured these things out, and that the estimates were plenty large enough.

The CHAIRMAN. Do you mean to say that shipbuilders in making contracts with the Government rely on information given to them by the Navy Department?

Mr. DUNN. That is precisely what they do.

The CHAIRMAN. And not on their own experience in building vessels of that character?

Mr. DUNN. Before the chairman came in I had stated with some detail that the peculiarity of this type of vessel is such that experience in building other vessels—any other vessels that had been completed before these contracts were let—does not enable you to make any accurate calculation as to its cost; but the department thought they could calculate it.

The CHAIRMAN. Would not this argument apply to every contract that is entered into by the Navy Department on the part of the Government for the construction of vessels of any kind?

Mr. DUNN. It certainly would not, Mr. Chairman.

The CHAIRMAN. If the contractor relies entirely upon the representations made to him by the Navy Department and has no other information about any other? Supposing a new company is organized and commences for the first time the construction of ships and goes to the Navy Department for information and gets all the information available there, gets all the light it can, and then in constructing the vessel they have a loss, and then they come in here and claim that they have had no experience in shipbuilding, and, as they have relied upon the representations of the Government, they ought to be reimbursed for their loss.

Mr. DUNN. No, Mr. Chairman, the point is here; there was no other possible way by which they could have determined the question. I put a question to a member of the committee in conversation that I would like to put here. Suppose I am going to build myself a house and that it is about the time when concrete construction first came in, and I am an expert engineer, a graduate of a technology school, and all that sort of thing and more or less an expert on all building matters, and I look into this new concrete proposition and then I send for some builders, some of whom have built a certain kind—the prevailing kind—of concrete houses, and others of whom have not built any, and I say, "Now, I want a concrete house built and I want to improve on anything that has ever been built before. I have some new ideas as to the way of making the concrete and the way of putting the thing together and the degree of thickness of walls, and strength of construction, and so forth, that I am going to work out. I have not drawn my plans in detail. All I know is the height and the breadth of the house and the thickness of the walls and the general location of the rooms and the total amount of concrete I want to have used. I will work those things out as I go along. I shall want you to submit drawings and I will pass upon them. But now I want you to make bids upon it. I want you to bid on that house, and I have set an upset price of \$10,000 for it." These contractors look into the figures on previous concrete houses and they find that previous concrete houses have been built for \$7,000. They say "There is no experience by which anybody can tell what these differences that this gentlemen proposes to make will amount to, but it certainly looks

as though \$3,000 would be enough margin, and he has studied into it; he is a man who has worked out these ideas, and he says \$10,000 will do it;" and so they put in bids of something less than \$10,000.

Now, when they go ahead to build for the first time in the world exactly such a concrete house as I have in mind, certain of my new requirements adding enormously to its cost, we find out that, when for the first time such a house as that is built, it necessarily costs, and would cost anybody, \$20,000 instead of \$10,000. Then the builder comes around to me and says: "Neither you nor I could tell beforehand what this would cost, but you had studied the question for a long time. I only had a few days to figure on it and you said \$10,000 would do it. I contracted to build that house for \$10,000 and I have done it, and if you want to insist upon it, I have no legal remedy, and that is all there is to it; if you feel it just that you should in fact get a \$20,000 house, half of it at my expense, when I have conscientiously gone on and met every requirement that you imposed and built you a house that is worth \$20,000 and you can sell for that—if you think it is just, then give me no more." Now, it seems to me that as a fair-minded man there is only one thing that I could say. I should say: "My calculations have been erroneous. It turns out that that could not be done at the price I thought it could. There was no way for you to know any better at the time. It was much better for me that you should be willing to undertake it than to lie back and say: 'I do not know; possibly you may be wrong, and I will not touch it;' and now that you have gone ahead and conscientiously built me a house that necessarily cost \$20,000, I am going to pay you \$20,000."

That is exactly the proposition which, in this particular, these boats presented.

Now, to go a step further, that is not the whole of the proposition. You know the Government prepares these contracts in a certain form and one has to sign them if he wants to do business at all. The Government has always provided that a great many things in their specifications shall be "as directed," or shall be "as the superintending naval constructor may require." I ran rapidly through the specifications for one of these boats. In the hull alone, to say nothing of the equipment and the machinery, I find 127 places where it said that something "shall be as directed," or some similar provision. It provided for a certain thickness of the plates in the hull, but it said, "but heavier material shall be used when directed." It provided for frames. Then it said, "Extra frames shall be put in where greater structural strength is required, as directed."

The CHAIRMAN. You were allowed extra for all of these?

Mr. DUNN. Not for one of them. That is a vital mistake that has been made in these hearings. The specifications state that something shall be so and so, "as directed," and additional requirements were imposed under those provisions, and not a cent has been allowed for any of them. As they went on, all the time these boats were building, the Navy Department and the naval constructors were studying the business of torpedo boat building. While these boats were under construction, the *Farraquat*, *Stringham*, *Goldsborough*, and *Bailey* were completed and were largely unsuccessful boats.

The CHAIRMAN. Before you get through I want you to specify any extras that any of these companies put in by reason of this condition of the contract which have not been paid for.

Mr. DUNN. They were not extras, Mr. Chairman. As I say, the specifications provided that the plates in the hull should be of a certain thickness unless heavier plates were required. In a great many cases the inspectors ultimately required that they should be thicker.

Mr. HAWLEY. Did they put that requirement in all contracts for vessels for the navy?

Mr. DUNN. Similar provisions had been put in all naval contracts. There was nothing in it that caused particular alarm when it was put in. In dealing with classes of vessels they were familiar with, with battle ships and cruisers, the builders who bid on them know from past experience approximately what will be necessary and approximately what the Government will require. Here they were starting out between them to build a kind of boat, and to fulfill requirements such as never had been made in any boat anywhere.

The CHAIRMAN. You do not mean to claim for your company, or for any of these companies, that they were in any way misled by misrepresentations made to them by any of the officers of the Government?

Mr. DUNN. They were unquestionably misled by misrepresentations made in good faith.

Mr. WALDO. You do not mean exactly "misrepresentations?"

Mr. DUNN. By erroneous estimates and calculations.

Mr. HACKETT. There was good faith in this on both sides, but they were both mistaken.

Mr. DUNN. I am very sorry the chairman was not here when I began. As I said then, when you push the speed of these small vessels and the load they must carry beyond a certain point, of course there is a limit that you can not pass, and as you approach that limit nearer and nearer the expense of material and design and construction and labor become enormously increased. They pushed the thing almost beyond the limit of possibility here—not quite—in the requirement of speed, combined with all the dead weight of equipment, and various provisions for other purposes, together with the structural strength that they required in the boats. They carried those things further than they had ever been carried in this country or in any foreign country, and nobody knew how much it was going to cost or even by what designs it was going to be accomplished. As a matter of fact, although, as I say, the department had estimated for a certain displacement, there was not one of these boats but what had tons and tons of material in it over the amount originally estimated by the department. These builders said when they bid: "We are limited to a displacement of so much, and we shall therefore have so many tons of material to pay for," and they figured as well as they could on that basis. "Our engines are to be of a certain horsepower," and they figured the horsepower of the engines. As a matter of fact, as the vessels neared completion the government inspectors said: "This is not strong enough. You must put in more plates there, as the specifications say we may require you to do. You must put in braces here, additional frames there. You must change this design here and there and somewhere else;" with the result that they required many tons of material to be put in over and above the original limit that they had placed on the total weight of the vessels. Then the result was that the horsepower that they had originally provided for would not drive that vessel at the speed of the contract,

and they said: "Well, you contracted to get that speed; you have to increase your horsepower." So they had to increase the horsepower of the engines from the original contemplation, and at the same time they put in so much weight at other places that they had to actually decrease the weight of the engines while they were increasing the horsepower.

None of those things had been figured out in detail beforehand. The drawings had not been made. Nobody had decided how those engines should be constructed. They said, "You builders make the drawings as the work goes on and submit them to us." One builder made 886 detailed drawings and submitted them to the Government and they accepted some and rejected some and kept some a year before they decided on them. They decided how they would build those boats as they went along, and they ultimately put into them a great deal more material, considerably higher horsepower of engines, and a great deal more strength of structural material than they had contemplated in the beginning. The department had estimated on this new problem, what it should be done for, in what time it should be completed, what weight of vessel would be necessary, and what horsepower of engines, and everyone of those calculations proved to be misleading. The builders relied on them; there was nothing anywhere that they could get that was any better. It was a matter that one had simply to calculate on, and the department had had more time to calculate on it than they had. Nobody could have estimated accurately on it without preparing actual designs and detailed drawings and testing them by experience. Nobody could tell how much it would cost to build an engine of the extreme lightness required here and of a certain horsepower unless he had detailed drawings to figure on. They had to work out every part of that engine and then look at those completed drawings and see how heavy the engine would be, how many forgings would have to go in it, and the character of the forgings. That had not been done. Even if it had, there probably would have been a miscalculation as to the power that engine would develop after it was built. But they had not even worked out the plans. They said, "We have estimated from what we know of other boats what speed you could get with an engine of this weight and horsepower; that you can get the speed and the other requirements with a certain weight of hull"—a smaller weight of hull for the dimensions of the boat than had ever been made before. Now the delays, that proved so expensive, were caused very largely by the department's delay over the consideration of drawings; and then further delay and an excessive number of expensive trials were caused by the experiments necessary to discover the miscalculations and work out the remedies.

The CHAIRMAN. Has there never been any complaint made to the Navy Department at the time of the completion of these contracts?

Mr. DUNN. Time and again.

The CHAIRMAN. The facts are that the testimony in this case shows conclusively that every concession asked for by these companies was granted, both as to speed and as to time.

Mr. DUNN. Mr. Chairman, the Navy Department made three calculations, as to the time, as to the cost, and as to the possible speed. There was not a single reason why they should yield the speed and yield the time that is not equally a reason why they should yield

the cost. The fact is that the department has admitted its error on all three of them. Two of them were within its power to deal with. It says: "We find we have miscalculated the speed you could reasonably expect to get with all the other requirements of these vessels. We find we have miscalculated the time, and we find that we have miscalculated on the cost at which they could actually be built. Now, it is within our power to correct our miscalculation as to the time by extending your time. It is within our power to correct our miscalculation as to the speed you could get without sacrificing strength and other requirements, and we will do that. It is not within our power to correct our miscalculation as to the lowest cost at which such boats can possibly be built, but we admit our error, and we recommend to Congress that they correct it."

The CHAIRMAN. In other words, they make a contract with you, and six or seven years afterwards, after you come in and report that you are suffering some losses, they come up here with you and ask us to reform the contract, and ask us to assume that neither of you were capable of making a contract.

Mr. DUNN. Exactly, for this new type of boat.

The CHAIRMAN. Let me suggest this, for the purpose of showing you the difficulty we are laboring under. Here are the Cramps, large Pennsylvania shipbuilders, who have had experience in building vessels, and in the Court of Claims one of their suits was for \$500,000. They got \$125,000, went to the Supreme Court, and the Supreme Court reversed the case and sent it back to the Court of Claims. They held in construing the contract the parties were bound by their contract. Now, they are here asking us to send the same case back to the Court of Claims with instructions to the Court of Claims to find that the contract did not mean what it said. You, in effect, are asking us to do the same thing.

Mr. DUNN. Not at all; we admit at once that under the contract we have no legal claim. We do not rely on any question of construction of the contract.

Mr. WALDO. You are asking us to reform the contract.

The CHAIRMAN. Or asking us to say in this case that neither of you knew what you were doing when you entered into the contract.

Mr. DUNN. We could not possibly have known. That is exactly what we are saying. We say, so far as it is a question of precedent, that no case can ever arise like this until the Government goes into the construction of another kind of vessel, which is an experiment, which has got to be worked out as they go along, and that case ought to be dealt with the same way if the same errors are made. The only really fair way to make contracts for work of such an experimental character would be on the basis of actual cost under government supervision, plus a percentage or a fixed sum for the contractor's compensation. That method is used in many commercial contracts of different kinds. When the problem is a new one and no one can tell what it is going to cost, that is the only way to work out justice to both sides under the terms of the contract. That wasn't done here, and now both parties to the contract come to you to make a fair and just settlement.

The CHAIRMAN. We are now seriously contemplating building air ships. If we establish a precedent of this kind here may we not be involved in a lot of trouble with air ships?

Mr. DUNN. I say, when the first air ship is built, if the company contracts with the Government, and if, with the best judgment they can use, they are in a situation of this kind, and the Government does not pay the contractor what it costs him, it ought to be ashamed of itself. I say that when they built the first vessels for the new navy they had a similar difficulty; they had no experience to go on in this country to guide them, and therefore they utterly miscalculated the cost, and John Roach was ruined. The Government ought to be ashamed of itself to say "We got you into this thing through your innocence and ignorance. Now, thank Heaven, the loss is on you. We have vessels that are worth millions more than we paid for them."

The CHAIRMAN. Where are those vessels now?

Mr. DUNN. In service. There is plenty in the evidence to show that they have proved eminently satisfactory in service. Several of them made a voyage to the Philippines.

The CHAIRMAN. Do you mean on that trip around the Horn?

Mr. DUNN. No, they went through the Mediterranean and through the canal, I think.

The CHAIRMAN. Did not some of the torpedo boats go with the fleet around the world?

Mr. DUNN. Yes; I think they did.

The CHAIRMAN. Let me make this suggestion: Can you not dictate what you have to say to the stenographer just as well when we are not here? We will read everything you will say, but we must go to the House now. There is a roll call on the urgent deficiency bill, and we must be there to vote on it.

Mr. DUNN. I assisted Mr. Bowles, Mr. Myers, and Mr. Wilson in the preparation of this statement here. To my mind there is not a word in it that is not essential to the understanding of this case; there is not a word in it that is not absolute matter of fact; and there is hardly anything that I could add to it or improve on it now. If I were to go back and prepare a brief to submit to this committee, it would be nothing in the world but a reprint of this statement, which, together with these gentlemen, I spent weeks on in studying at the time it was being prepared.

Mr. HACKETT. May I ask you this, if there is any special question that any member of the committee wants to ask, ask it now and Mr. Dunn will meet it.

Mr. DUNN. I am coming to that. I want to say one word more about this. This is a serious matter to these people. It has put nearly all of them into bankruptcy. We do not ask Congress, of course, to act on that account alone. It is also a serious matter on the part of the nation. We are absolutely satisfied that any fair-minded man, such as the members of this committee, who will go into the thing far enough will be convinced of the justice of it. I want to urge the committee, and every member of it, not to decide against this thing until he has carefully read that statement. I would like to submit this "Statement of the builders" as a part of my argument here and have it made a committee document. I am convinced that there is only one answer to it, when it has been carefully read and studied, and if there is anything in it, after it has been read and studied, any facts stated in it that the committee has any doubt about, we are prepared to produce ample evidence of every such fact. It is the result of careful investigation, careful reading

and study of the evidence, and I have not any question that everything it says is so, and that when everything it says has been fully grasped the situation will appear just as I have put it here, a situation where the miscalculations of the Navy Department in every particular misled these people. They built the best torpedo boats and torpedo-boat destroyers that had ever been built anywhere. They are asking you to pay a price for them much less than they cost and less than they would have cost anywhere else in the world. They are asking now simply to be paid what the boats are worth, a value which they have fully represented to the Government every since; and whenever a similar situation arises I believe that the United States Government ought to be large enough and fair enough and upright enough to meet it in the same way. It is not even what they ought fairly to have cost, because that would have included a profit and also an allowance for the increased general expense for delay, neither of which is included. Neither is the excessive number of trials required by the department's wrong calculations included in the Ramsey Board's figures. The actual losses amount to about \$3,000,000; the Ramsay Board figures are nearly \$1,000,000 less than that, and they are unquestionably below the fair value of the boats.

The CHAIRMAN. I do not think there is any disposition on the part of the committee to hurry up matters in this case. I want to read everything there is in it, and I am going to ask to have this record sent down to the printer and printed. There was some talk about taking a vote upon this matter this week. Personally I am not prepared to vote on it and do not intend to until I am satisfied, either that you ought to recover or ought not to.

Mr. DUNN. There is one point that I have not spoken of that I think is very important. I want to distinguish between two things. I wish Mr. Kitchin was here. So far as conditions prevailed in this country, at the time these contracts were let, which necessarily required that materials should cost more than they cost abroad, that is, of course, one of the elements that entered into the miscalculation. So far as there was, through the general prosperity of the country, a rise in the price of materials and labor while this work was going on, that was unquestionably something of which the contractors took their chance. The rise in the cost of materials and labor, while this work was going on, represents only a small part of the loss, and is fully covered in the excess of the actual loss over the Ramsay Board's figures. To ask nothing more than the fair cost of building such boats, if the department and the builders had known what they were about, at the prices and under the conditions prevailing at the time the contract was let, or at any time before or since in this country.

I will submit a brief summary of our contentions to be added to my argument. But the statement of the builders contains a much more adequate presentation of the case.

STATEMENT OF CLARENCE W. DE KNIGHT, ESQ., OF WASHINGTON, D. C.

Mr. DE KNIGHT. Mr. Chairman and gentlemen of the committee, inasmuch as the hour for adjournment has arrived, I will not detain the committee further than to submit a copy of the "statement of

the builders of torpedo boats and torpedo-boat destroyers," to this committee in the Fifty-eighth Congress, a very carefully prepared document, which I understand is to be printed as part of this hearing. (See Appendix, p. —.)

(Thereupon at 12 o'clock m., the committee adjourned until Thursday, January 21, 1909, at 10.30 o'clock.)

SUMMARY OF THE CLAIMS OF THE BUILDERS, SUBMITTED BY MR. DUNN
AFTER HIS ARGUMENT.

In considering the causes of the heavy loss suffered by all the contractors, the first question is, whether this loss resulted from inadequate contract prices or from excessive cost. Exactly what is meant by this distinction may be explained as follows: If the actual cost of these vessels was a fair, normal, necessary cost under the conditions which prevailed at the time the contracts were made, then it would follow as a necessary conclusion that the contract prices were inadequate and all the loss would be chargeable to that cause. If the contract prices represented the fair, normal, necessary cost of the vessels under the then prevailing conditions, all the loss would be chargeable to excessive cost. (Reference is made to the conditions prevailing when the contracts were made, because if the cost of labor or materials was increased by an unexpected change in conditions in the country at large it could fairly be said that the builders took the risk of any such change in conditions.)

Using the words in the sense above explained, the loss in this case was, in fact, chiefly due to inadequate prices, and in smaller part to some items of excessive cost. In other words, the fair, normal, necessary cost of the vessels under the conditions prevailing when the contracts were made would have been far above the contract prices, and at least equal to the fair average prices fixed by the Ramsay Board, but not as high as the actual costs reported by the builders.

So far as the loss resulted from inadequate prices (in the sense above defined), the Government can make good the loss without paying any more for the vessels than they are fairly worth and ought reasonably to have cost. Whether the Government ought to do so depends, however, on the causes which resulted in the fixing of such inadequate prices. So far as the loss resulted from excessive cost, any equitable claim against the Government must proceed on the ground that the Government was directly responsible for such excessive cost.

To answer these questions, the cause of loss will be further itemized under the two heads above distinguished.

A. INADEQUACY OF CONTRACT PRICES.

This resulted from the following causes:

1. The novelty and extreme difficulty of the problem of combining high speed with greater structural strength and more exacting requirements for equipment, carrying capacity, conveniency, comfort, and habitability, than had ever before been required in boats of this class. The difficulty of this problem could not be fully appreciated until tested by actual experience. It was underestimated, and undoubtedly would have been underestimated even if all the builders had had

experience on previous types of torpedo boats, and even if detailed drawings and specifications had been prepared in advance.

2. The fact that detailed drawings and specifications were not prepared in advance so that very few options or even estimates could be obtained from manufacturers, and the amount and character of materials and labor required could not be estimated by the contractors on any accurate basis, or, in view of the novelty of the problem, on any basis even approximately accurate.

3. The requirements as to kind and quality of material, supplemented by the most exacting tests by the government inspectors, calling for the use of a higher and much more expensive grade of materials than had ever before been used for the same purposes. The necessary cost of such materials, applied to these purposes and subjected to these tests, was underestimated, and undoubtedly would have been underestimated had detailed drawings been available—though in that case the builders might have been able to obtain options by which they could have thrown some of the loss on the manufacturers. See note below on material prices.

4. The miscalculations of the department, as to design, displacement, and horsepower, necessitating changes of design and the use of additional material to prevent excessive vibration and provide sufficient structural strength, thus largely increasing the total weight of the boats; necessitating also an increase over the contemplated horsepower to obtain an acceptable speed, thus largely increasing the cost of the engines. Under the terms of the specifications nearly all these changes could be made and were made without any allowance for extras. In preparing their bids, however, in the absence of detailed drawings, the contractors had practically nothing to go by, except the estimates and requirements of the department as to general weight of design, total displacement, and horsepower. Such estimates as they were able to prepare had to be based on this data, all of which proved to be erroneous.

5. The similar miscalculation of the department as to the time in which the work could be done, affecting very seriously the item of general expenses. See note on time of construction below.

6. The constant stiffening of requirements by the department inspectors during all the period of construction, which the terms of the specifications permitted, and which resulted in better boats than could otherwise have been secured and more serviceable boats than any previously constructed here or elsewhere, but which proved very expensive to the builders and which they had no reason to anticipate. Similar provisions are contained in all naval specifications, but the power thus given was exercised in this case to an unprecedented degree. Any naval contract in which this power was similarly exercised would result in a disastrous loss to the builder:

7. The inexperience of the builders. Only one had ever completed any torpedo boats, and those boats were of so much less exacting requirements that experience of their cost was misleading rather than helpful. Four other builders had torpedo boats under construction, but as reported by Secretary Long (S. Doc. 112, p. 137) had not advanced far enough with them to gain experience of practical value in making bids, and these boats also were of so much simpler requirements as to furnish no basis for just comparison. Five of the build-

ers had never done any naval work. With one partial exception, none of the contractors had ever attempted, or had any occasion, to study, as the Government had done, the general problem of torpedo-boat construction, and the materials, designs, and methods by which the superior results desired and ultimately attained in the new boats could be secured. The Bath Iron Works had purchased a set of plans from the leading French builder, and their representative had spent some time in his yard. But the new boats had in several respects more exacting requirements than any of the French boats and subsequent experience showed that these requirements (some of which were not specified in advance but were imposed by the government inspectors during construction) increased the difficulty and cost to an extent which neither the department nor the builder did anticipate or could reasonably have anticipated. In the absence of the experience only to be gained by completing and testing boats of similar requirements, any inferences drawn from comparison of the costs of previous boats of different types was, for the reason stated under No. 1 above, only calculated to produce a feeling of false security in accepting estimates which afterwards proved to be entirely inadequate.

8. The short time allowed for bids, from July 3 to August 23, 1898. For the reasons above stated an approximate estimate of the cost of such boats as were ultimately built could have been reached only by collecting all possible data as to previous boats, making an elaborate study of the engineering problems, working out the designs in detail, experimenting with the materials required, calculating weights, strains, horsepower and speeds, and considering carefully every element entering into the complicated problem. Even then there would have been room for large error, as experience with these boats afterwards proved. The department experts had studied these problems and attempted to work them out. Their estimates proved to have involved serious miscalculations. If the builders had had the time to collect all the available data and study thoroughly all the elements of the problem, they probably would have gone as far astray as the department did. But they had no adequate time in which to study so difficult and complicated a problem, and they necessarily relied on the estimates of the department experts as the most reliable data available.

9. The assurances given by the department officials, that the upset prices would allow an ample margin. (See letter of Admiral Melville, hearing of Feb. 16, 1906, pp. 13 and 14, confirming the testimony of the builders before the committees.) The estimates of the department had proved reliable in the past, and the department felt sure they were adequate in this case and so assured the builders. The builders knew the department had made a study of the problem which they themselves had had no sufficient opportunity to make, and they had every reason to suppose the department knew more about it than they did.

For the reasons Nos. 1, 2, 3, 7, and 8 above, the builders as a practical matter had to rely almost entirely on the estimates of the department; they were further misled by the miscalculations referred to under Nos. 4 and 5 above, and they could not anticipate or provide for the stiffening of requirements referred to under No. 6. There was entire good faith on both sides, but the department estimates proved

to be wholly inadequate, and contract prices based on those estimates were therefore far below the necessary normal cost of such boats as were actually built.

Looking back at the question now in the light of experience, the inadequacy of the department estimates is fully explained by the first six reasons above enumerated. But a study of those reasons will show that the difficulties and the causes of error could not possibly have been fully appreciated in advance, and that when the department which had studied the problem was confident that its own estimates were sufficient and so assured the builders, the latter could hardly have done otherwise than to accept and rely upon those assurances. This conclusion is fully supported by the opinions expressed in the official reports of the department, and is the basis of the department's recommendation in favor of the relief which the builders now ask.

Note on material prices.—The cost to the contractors of the materials used in these boats, particularly the hull plates and the forgings, was exceedingly high as compared with the plates and forgings for previous vessels, the difference being much greater than could have been anticipated in advance. Two causes, and possibly three, contributed to this high cost. In the first place there was a rising tendency in the price of all materials during the period of construction. A much more important reason, however, was the extreme difficulty of manufacturing these materials so as to satisfy the government tests. This question is discussed at length on pages 50 to 55 of the "Statement of the builders." It has also been suggested that there may have been an artificial raising of prices for forgings due to the monopoly enjoyed by two manufacturers. If this was the case, the government requirements had put the builders at the mercy of these manufacturers. Exactly how far the high cost of materials was due to each one of these three causes it is impossible to say. In view of all the evidence, however, it seems doubtful if there was in fact any considerable artificial marking up of prices, and it is clear that whatever effect the general rise in the price of material may have had, the manufacturers must necessarily have charged very high prices to cover the cost of forgings, extremely expensive in the first place, and which frequently had to be made many times over to satisfy the government tests. In other words, there is reason to believe that the greater part of the high cost of materials was a fair and necessary cost, considering the difficulty of manufacture, and may therefore properly be classified under the head of "Inadequacy of contract prices."

Note on time of construction.—All of the boats took much longer to complete than was contemplated in their contracts, the delay proceeding from several causes. In the first place, the materials, particularly the forgings, were very difficult to manufacture and were subjected to very exacting tests. After many months of work on a single forging, it might fail to pass the rigid inspection to which it was subjected, and then there must be an appeal to the department involving further delay, or all of the work must be done over again. Not infrequently as many as ten forgings had to be made before one was secured which would satisfy the government tests. There were only two concerns prepared to take orders for these forgings, and they worked night and day for three years to fill the orders

for these boats and for other naval vessels building about the same time. It would have been impossible for these two concerns, without enlarging those portions of their plants adapted to this work, to get out the necessary materials in the time allowed in the contract. No other concerns in the country had the necessary equipment. This was a condition existing when the contracts were made, but as no one had any experience of the extreme difficulty of manufacturing the materials required, the time that would be required to obtain these materials was very much underestimated.

In a few instances the contractors may have had a legal claim against the manufacturers for delay. In most cases, however, the manufacturers refused to bind themselves to any fixed time, and where there had been a contract on that point the builders were obliged, as a practical matter, to waive their legal right in order to get the material at all. Had they been able to recover damages for delay they would merely have transferred to the manufacturers an actual loss, which, in justice, neither the shipbuilders nor the manufacturers ought to bear.

The working out of the necessary detailed drawings and their approval by the department officials also occupied much more time than had been anticipated. The general designs of all the boats, except those of the Bath Iron Works, were the Government's designs. In all cases, however, the builders were, as a part of their work, to prepare detailed drawings and submit them to the department. These drawings were frequently held up for a long time, and then they were sometimes rejected and new drawings had to be made. With all possible diligence on the part of the builders it was impossible to work out all the complicated problems involved, complete all the designs, and get them accepted, within the time allowed by the contracts, even had the department acted with the utmost promptness. In fact, the department sacrificed speed of construction to the effort to secure the best possible results, and spent a great deal of time in the consideration of the designs and working out the details.

More serious still was the delay resulting from the miscalculations discussed above. It was practically impossible to know, without the test of experience, exactly what weight of hull, power of engine, and strength of structure would accomplish the desired results. All of the boats developed on their first trials defects which required time and repeated trials to remedy, and this resulted in long delays which were not anticipated in advance, which, in view of the extreme difficulty of the problem, could hardly have been avoided, but which, after the experience gained from the construction of these boats, would not need to be repeated.

All these delays were very costly to the builders, partly because it always increases the labor cost if work is constantly interrupted and resumed, but chiefly because of the increase in general expense. While these boats were in the yards and occupying the attention of the shipbuilder's force they excluded other work, and if there was a delay of a month, or three months, or six months, the items of general expense went on just the same. Other work could not be taken on, because the shipbuilders must be ready to resume work on the boats whenever the particular delay came to an end. The laborers working directly on the boat could be laid off or transferred to other work; there could be no similar interruption of the general expense.

General expense includes everything not directly chargeable to a particular piece of work—such items as foremen, superintendence, office expense, taxes, insurance, freight, power, lights, depreciation of plant and buildings, water rates, etc. It represents a large item in the cost of any vessel, even if conditions are such that the work in the yard can proceed without interruption. In the case of these boats it took at least twice as long for their construction as if all the drawings had been prepared in advance in the form which they finally took and all the materials had been obtainable without delay. The usual charge for general expense ought, therefore, to have been at least doubled in reckoning the actual cost of these boats; yet in the returns of actual cost and in the Ramsay Board figures only the normal percentage of the labor cost or labor and material cost is added for general expense.

To a considerable extent this loss from delay ought to be classified under inadequacy of contract prices, since to a considerable extent it was inevitable under the conditions prevailing when the contracts were let. In other words, under those conditions the materials could not possibly have been obtained, and the necessary problems of design could not possibly have been worked out and all the necessary drawings made in such time as to permit the completion of the boats within the contract period. That part of the delay resulting from department miscalculations which had to be corrected may properly be charged to excessive cost, in the sense that had correct calculations been made in advance much of the delay might have been saved. It was hardly possible, however, that so new and difficult a problem could have been correctly solved on paper, or in any way except by experience and trial.

However the loss from delay is classified, it was not the fault of the builders, and might properly have been figured in their claim for relief. Recognizing the facts above stated, the department extended the contract time, but it had no power, without the action of Congress, to make good the money loss involved.

B. ITEMS OF EXCESSIVE COST.

As stated above, the actual cost of the boats was in certain particulars higher than the fair, normal, necessary cost, under the conditions prevailing when the contracts were made, of such boats as were ultimately built. The causes of this excess were as follows:

1. Rise in the price of materials and labor. The evidence shows that during the time the boats were under construction there was, as a result of the general prosperity in the country and the large amount of manufacturing and construction work going on, a general rise in the price of materials and labor which somewhat increased the cost of these boats over what it would have been had the conditions prevailing in 1898 remained unchanged. The builders freely admit that any part of the loss resulting from this cause was a risk which they assumed. It represented, however, a comparatively small proportion of the total loss. (See note on material prices above.)

2. Costly experimenting in working out the problems of design, horsepower, displacement, structural strength, and speed. The original miscalculations of the department as to displacement, horsepower, and structural strength and the extreme difficulty of the problem imposed on the builders by the unprecedented requirements as to

equipment, carrying capacity, convenience, comfort, and habitability, with the many tons of dead weight which they involved, not only contributed to the fixing of upset prices and contract prices far below the necessary cost of the boats, as shown under the preceding head, but resulted in an actual cost considerably above what it would have been had the department calculated correctly the amount of material and the general strength of design that would be necessary to give sufficient strength to the hull and the horsepower of engines which would be required to obtain an acceptable speed and if detailed drawings adequate to fulfill the requirements of the boats had been prepared in advance. The maximum amount of displacement was definitely stipulated, and in working out their designs all the builders were originally limited to such amount and weight of material as would bring the total within the displacement allowed. During the construction of the boats the department experts were studying the subject of torpedo-boat building and learning new lessons from the boats which were under construction when these contracts were made and were completed while these boats were under construction. As a result of this study and experience and of the preliminary trials of these boats they discovered their miscalculations as to displacement and structural strength, and under the clauses of the specifications which permitted them to do so ordered the hulls to be strengthened, involving a considerable increase in weight, and made changes in the design both of the hulls and of the engines to prevent excessive vibration. The increase in weight required an increase in the horsepower of the engines, and at the same time the weight of the engines had to be diminished. In short, the first trials of all the boats disclosed numerous errors which had to be corrected. The result was that a great deal of work had to be done twice, and the actual cost was therefore considerably more than it would have cost to duplicate the boats after these lessons had been learned.

3. Delays over the approval of drawings, and further delays resulting from the discovery of the original miscalculations, and the time and experimenting necessary to correct them. (See note on "Delay in construction" below.)

4. The excessive number of costly speed trials resulting from the discovery at the first trials that the original calculations as to displacement, structural strength, and horsepower had been erroneous, necessitating repeated experimenting and repeated trials to reach the solution of the very difficult problem which the requirements for these boats involved.

The four items above enumerated under the heading of excessive cost are placed under that head simply because each of them tended to make the actual cost exceed the fair, normal, necessary cost, under the conditions prevailing when the contracts were made, of such boats as were ultimately built. It is by no means clear that the cost was excessive in any other sense. So far as the first item is concerned, that relating to rise in the price of materials and labor, it was nobody's fault, and it could not be helped, but it is not properly the basis for any claim for relief. The causes enumerated under the other three items were causes which operated to make the actual cost of these boats larger than it need have been if all the lessons learned during their construction had been known in advance. The work was based on the designs, calculations, and estimates of the department, accepted

and relied on by the builders, and those designs, calculations, and estimates proved to be defective and erroneous. The additional cost included under items 2, 3, and 4 was the result of those defects and errors.

If the contractors had had previous experience with boats of equal requirements, they might of course have realized and corrected these miscalculations at the outset. But they had even less knowledge and experience on the subject than the department, and necessarily accepted and relied on the department's calculations.

It will be apparent, however, from what has already been said of the extreme difficulty of the problem which these boats involved that it would have been well-nigh impossible for the most expert naval engineers in the world to solve correctly in advance, without the test of actual experience, all the complicated engineering questions presented. The novelty of the problem and the inexperience of both the department and the contractors were part of the conditions under which the work was undertaken. It could hardly have been expected that the first boats ever built with such exacting requirements could be constructed, under such conditions, without costing considerably more than it would cost to duplicate them after the problems had once been worked out by actual experience.

For a fuller and more adequate treatment of all the matters above briefly stated, reference is made to the "Statement of the builders" hereto appended.

The causes of the builders' loss having been examined and classified, it remains to inquire how far they are entitled to reimbursement for this loss.

For that part of the loss which resulted from the inadequacy of the contract prices, as that term is above defined—in other words, that part which would be made good if the Government were to pay simply the fair, normal, necessary cost of such boats under the conditions prevailing when the contracts were made—the builders submit that their claim to compensation rests upon sound principles of justice, equity, and public policy. For the reasons above enumerated under the head of "Inadequacy of contract prices," it was simply impossible for the builders to know in advance what the work would cost, and if they were to bid at all there was nothing on which they could so reasonably rely as the estimates and assurances of the department. It is hardly in keeping with the dignity and honor of the United States Government, having obtained contracts under the circumstances above described, at prices for which such boats as the Government required could not possibly have been built here or elsewhere at that time or any other, to withhold payment of the value of what it has received, and the Navy Department at once recognized the equities of the situation and recommended the case for congressional action. No honorable and fair-minded private citizen would under similar circumstances stand upon his legal rights and permit a contractor whom he had induced by similar assurances to enter into a contract about which the contractor himself could not possibly have adequate knowledge, and who had conscientiously fulfilled every requirement imposed upon him, to be ruined for want of that compensation, outside the terms of the contract, which the service rendered was fairly worth.

That part of the loss which represents an excess of actual cost over what these boats must necessarily have cost if all the lessons learned in their construction had been known in advance, stands upon a somewhat different footing. Leaving out the general rise in prices of material and labor, which was unquestionably the builders' risk, that increase in expense which was incidental to the working out for the first time of a difficult and complicated problem was, for the reasons set forth above under the head of "Items of excessive cost," to a considerable extent directly chargeable to errors in the designs, calculations, and estimates of the department. On this account the builders might not unreasonably claim compensation for these losses also, and if the result involved a cost to the Government of more than it would now require to duplicate the boats, it would still be true, as already pointed out, that the first boats built with such novel and difficult requirements must naturally cost more than similar boats would cost after the problems had been once worked out.

If it be said that the builders ought to have known they were undertaking without experience the solution of a very difficult engineering problem, on which foreign builders had been working for years before they attained even a measure of success, which would still have been insufficient to satisfy all the requirements of these boats, and ought therefore to have realized that errors in the department's calculations were likely to develop, involving increase of cost and possibly loss to the builders, the answer is that the only way they could have protected themselves against such loss was not to bid at all. Their bids could not exceed the upset prices, and they bid as near those prices as they dared, in view of the competition which it was the deliberate purpose of Congress to bring about. It was one purpose of the act of 1898, requiring as it did the distribution of the contracts among a considerable number of builders, to secure the services of contractors not previously experienced in naval work, and thus enlarge the list of those on whom the Government could rely for future competition. In venturing into a field almost wholly new to most of them, the contractors did exactly what Congress intended that they should do, and they did it relying on the assurances of the Navy Department that the work could be done well within the prices set.

It was unquestionably good public policy to induce as many competent shipbuilders as possible to take up this type of work, that there might be in the future a large number of firms in the country experienced in such work, and ready to compete for it at any time, or to assist the Government in meeting any sudden emergency which might arise. To refuse the relief now asked is to throw away whatever it might be possible to save of the benefits of that policy. If this relief could have been promptly given when first recommended by the department, several of the contractors might have been saved from the bankruptcy which overtook them, and many of them would undoubtedly have been disposed to take additional contracts at fair prices, fixed in the light of the experience they had gained. As the matter now stands, several of these concerns failed utterly, and the experience of those which managed to survive was so bitter that only the two whose yards are not adapted to any other kind of work would now consider a naval contract.

The same public policy which dictated the distribution of these contracts among as many shipbuilders as possible very powerfully recommends such a course of dealing with the unfortunate contractors as will lead them and other firms to feel that the Government can be trusted to deal justly with them.

Nevertheless, the builders are not disposed to press their claim as far as it might justly be pressed. They appreciate the difficulty of the problem which the Navy Department attempted to solve; they feel no resentment against the department for errors made in good faith, and which, looking back at the question, now appear to have been unavoidable; they fully appreciate the prompt recognition given by the department to their claims; they are prepared to look at the matter as a problem which they undertook to solve jointly with the Navy Department, and now that experience has shown that both the builders and the department greatly underestimated the difficulty and the expense necessarily involved, they are willing to bear a part of the burden of that error. They have never asked compensation for all their loss. But since the department had at least a better opportunity to study the question than they, and frankly and freely admits its own responsibility, they feel it only just that the Government should also bear its share, especially when by so doing the Government will have lost nothing to which it was equitably entitled, and will pay only that for which it has received full value.

The builders, therefore, ask of Congress only such relief as will cover the fair normal, necessary cost of the boats—what they would necessarily have cost even if the contractors had had, before they began, all the experience which they gained in the building of these boats, and had been able to solve at once from that experience every problem which the Government requirements presented. What they now request is not even the prices which they would have asked and ought fairly to have asked in the beginning had they known everything they have since learned about the difficulties and expense necessarily involved, for such prices would have included a reasonable profit, and they ask now for nothing more than the actual necessary cost of the boats under the conditions prevailing when the contracts were made.

Of the two bills now before the committee, one calls for the payment to each contractor of the sum necessary to make up the fair average cost reported by the Ramsay Board. It is true that the Ramsay Board's figures were not made up on exactly the line of division herein marked out. They do not include any allowance for increase in general expense through delay, although, as pointed out above, a considerable portion of the delay could not possibly have been avoided, and the increased cost which it involved was a part of the absolutely necessary cost under the existing conditions. The Ramsay Board did follow, however, the line of distinction above marked out in making no allowance for any unusual number of trial trips. On the other hand, the board reached its figures for cost of material on the basis of the prices actually paid. As those prices varied somewhat with different builders and at different times in the course of construction, the cost of material, as fixed by the Ramsay Board, was a sort of average of the reported cost. It is impossible to

say now whether such an average figure includes any part of the general increase in the cost of materials which was the builders' own risk, or whether it is no more than material so difficult to manufacture would fairly have cost on the general scale of material prices prevailing in 1898.

Looking at the evidence as a whole, however, the builders believe it to be reasonably clear that the prices fixed by the Ramsay Board are no more than the fair, necessary, normal cost of the boats under the conditions prevailing in 1898, and the department itself has in substance expressed that opinion.

But if the committee should feel that there ought to be a further inquiry into the causes of loss, and the proportion of the loss due to each of those causes, the builders will cheerfully furnish further evidence to the committee, or accept a reference of the matter to the court of claims, with directions to inquire into any questions which may appear to the committee to call for further investigation, and to award compensation to the builders upon any basis which may appear to Congress to be just and fair.

Table showing the percentages of different items making up the fair average cost as reported by the Ramsay Board.

[NOTE.—The report of the bureaus of Construction and Repair and Steam Engineering, approving the report of the Ramsey Board (S. Doc. 112, 58th Cong., 2d sess., p. 7), gives the totals for labor and material as determined by the Ramsay Board. The percentage allowed for general expense is given in the testimony of Admiral Ramsay before the Senate committee, March 14, 1904 (Senate Hearings of 1904, p. 63). The following table is based on the evidence thus afforded.]

TORPEDO BOATS.

	Amount.	Per cent of total.
Fair average cost of—		
Labor.....	\$86,938	39
Material.....	86,358	38
General expense.....	43,469	19
Trials.....	7,535	4
Total fair average cost.....	224,300	100

DESTROYERS.

	Amount.	Per cent of total.
Fair average cost of—		
Labor.....	\$133,515	36
Material.....	170,085	45
General expense.....	60,081	16
Trials.....	10,519	3
Total fair average cost.....	374,200	100

APPENDIX.

STATEMENT OF THE BUILDERS OF TORPEDO BOATS AND TORPEDO BOAT DESTROYERS TO COMMITTEES ON CLAIMS, FIFTY-EIGHTH CONGRESS, REQUESTING RELIEF (S. 4008, H. R. 10346).

THE BILL.

Senate bill 4008 and House resolution 10346, entitled "A bill to provide for the relief of the Bath Iron Works and others," provides for the payment by the Secretary of the Treasury to the builders of certain torpedo boats and torpedo-boat destroyers, heretofore authorized by Congress, of the fair average cost of the said boats without profit, less the amounts already paid each builder on account of the said boats. The payment is to be made only after completion and acceptance. The boats designated in the bill and included within its provisions are the 12 torpedo boats and 16 destroyers authorized by the act of Congress of May 4, 1898. All but one of these boats are now completed and have been accepted by the Government. The builders for whose relief the bill is introduced are the following:

The Bath Iron Works, of Bath, Me.
George Lawley & Son (Corporation), Boston, Mass.
Fore River Ship and Engine Company, Quincy, Mass.
Gas Engine and Power Company and Charles L. Seabury & Co. (Consolidated), Morris Heights, N. Y.
Lewis Nixon, Elizabethport, N. J.
William R. Trigg Company, Richmond, Va.
Columbian Iron Works and Dry Dock Company, Baltimore, Md.
Neafie & Levy Ship and Engine Building Company, Philadelphia, Pa.
Harlan & Hollingsworth Company, Wilmington, Del.
Union Iron Works, San Francisco, Cal.
Maryland Steel Company, Sparrows Point, Md.

The "fair average cost" is to be taken as heretofore determined by a board of naval officers appointed by the Secretary of the Navy to investigate and determine the proper average cost of the boats in question.

The purpose of this measure is to make good to the builders of the boats in question a substantial part of the very serious actual money loss which they have sustained in the faithful and satisfactory performance of their contracts with the Government for torpedo boats and destroyers which the Government has accepted and which are now an efficient and valuable part of the navy.

GROUND FOR RELIEF.

The grounds on which this relief is proposed, briefly stated, are as follows:

1. That the contracts were placed at a time when neither the Navy Department nor the contractors had any sufficient experience on which to base a proper estimate of the cost of boats such as the specifications required.
2. That it was not reasonably possible for the contractors, within the time allowed for making their bids, to estimate even approximately what the boats would actually cost, or to take adequate precautions against loss.
3. That under these circumstances the bids were necessarily and properly based very largely upon the upset prices fixed by the Navy Department.
4. That, as shown by subsequent experience, the contract prices thus fixed were entirely inadequate to cover the necessary cost of construction, and the boats could not possibly have been built at a cost within the original appropriation.
5. That the loss to the contractors, which was thus inevitable, was greatly increased by several causes not within the control of the contractors, and not properly classed among the risks which they assumed, including some causes for which the Navy Department was directly responsible.

6. That the builders continued in good faith to the best of their ability and with all reasonable economy in their efforts to make the boats conform to the requirements of the department, and only asked for small modifications after it had become apparent that the contract requirements were impossible of fulfillment except by an expenditure of time and money utterly disproportionate to the advantage to be gained.

7. That after such modifications were granted by the Navy Department the contractors satisfactorily completed and delivered the boats and the Government accepted them; that the work of the contractors was well and thoroughly done and the boats have proved efficient and satisfactory.

8. That the actual cost to all the contractors was largely in excess of the contract price which the contractors have received, so that the Government has obtained the boats at a price far below cost, and has profited to the extent of between two and three million dollars at the expense of the contractors.

9. That this situation results from conditions so unusual as both to raise a strong equity in favor of the contractors and to remove all risk of establishing an unwise precedent.

It is proposed to pay the contractors, not what would be a fair price for the boats, because such a price would include a profit on the actual cost, but merely a sufficient sum to cover the fair average cost of the vessels. Even under the provisions of this bill the contractors will not be made whole, for in determining the fair average cost, as will presently appear, certain expenses necessarily incurred by the builders in their earnest efforts to fulfill their contracts have nevertheless, for reasons stated below, been disregarded.

The proposal embodied in the bill is, of course, a somewhat unusual one, and the burden is upon those who advance it to produce satisfactory evidence of the facts upon which their claim is based, and satisfactory arguments for its justice and expediency. In the present instance the investigation of the facts has been careful and thorough, and it is not necessary to take anything upon theory, supposition, or guesswork. A brief history of the steps taken to investigate the contractors' claims will make this clear.

THE INVESTIGATION OF THE CONTRACTORS' CLAIMS.

The act of Congress authorizing the construction of the vessels in question was approved May 4, 1898. The bids were opened August 23 of that year, and contracts were awarded shortly afterwards to the eleven bidders already enumerated, as follows:

For the torpedo boats.

Bath Iron Works.....	3
George Lawley & Son (Corporation).....	2
Lewis Nixon	2
William R. Trigg Company	3
Columbian Iron Works and Dry Dock Company.....	1
Gas Engine and Power Company and Charles L. Seabury & Co. (Consolidated) ..	1

For the destroyers.

Neafie & Levy Ship and Engine Building Company.....	3
William R. Trigg Company.....	2
Harlan & Hollingsworth Company.....	2
Fore River Ship and Engine Company.....	2
Union Iron Works.....	3
Gas Engine and Power Company and Charles L. Seabury & Co. (Consolidated) ..	1
Maryland Steel Company.....	3

The builders met with unavoidable delays, as a result of which the Navy Department made considerable extensions in the time allowed for completion.

On November 11, 1901, the Bureau of Construction and Repair directed two officers, Naval Constructor J. H. Linnard and Lieut. L. H. Chandler, to inspect all torpedo boats and destroyers then under construction on the Atlantic coast and report to the bureau as to the condition of the boats at that time, the prospect of successful completion, the causes of delay, etc. These two officers reported at considerable length on November 25, 1901.

On January 17, 1902, when all of the vessels were nearing completion, a committee of the contractors addressed a communication to the Secretary of the Navy, containing a statement from each contractor as to the actual cost of the boats up to that time, asking slight modifications in the speed requirements of the contracts, and further asking reimbursement to the extent of at least one-half of their actual losses. The

modification in the requirements of the contracts was granted by the department after investigation; the request for reimbursement was properly regarded as a matter for congressional action.

Before referring the question to Congress, however, the Navy Department made a careful investigation. The matter was first considered by the bureaus of Construction and Repair and Steam Engineering, and those bureaus made a joint report. It was then referred to the Board on Construction, which also reported to the department. On the recommendation of the bureaus of Construction and Repair and Steam Engineering a board of naval officers was appointed by the department on February 26, 1902, consisting of Rear-Admiral Francis M. Ramsay, U. S. Navy, retired, as president of the board, and Pay Inspector Stephen Rand, Lieut. Commander John R. Edwards, and Naval Constructor Lawrence Spear, U. S. Navy, as members. This board was instructed to confer with such of the contractors as might be necessary, to examine books and vouchers, to take sworn statements or affidavits, and, finally, to report to the department what had been the proper average cost of each class of vessel, torpedo boat, and torpedo-boat destroyer, including all direct charges of material and labor, and all proper indirect expenses, but excluding all profit. On April 9, 1902, the Ramsay Board, after following the instructions of the department as to the collection of evidence, reported to the Navy Department, fixing the proper average cost, without profit, of each class of vessel. This report was approved by the bureaus of Construction and Repair and Steam Engineering.

On April 25 Secretary Long, then Secretary of the Navy, forwarded to the House Committee on Naval Affairs of the Fifty-seventh Congress, in response to a request from the committee, a copy of the original request of the committee of contractors, the reports thereon of the bureaus of Construction and Repair and Steam Engineering, and the Board on Construction, the department's instructions to the Ramsay Board and the bureaus, the record of the proceedings of the board, and its correspondence, a copy of the report of the Ramsay Board, and the comments thereon by the bureaus of Construction and Repair and Steam Engineering. These papers were accompanied by a letter from Secretary Long to the chairman of the committee, summing up the situation, and expressing the opinion that the circumstances were such as to entitle the builders to equitable consideration. All these documents are printed in Senate Document No. 112, Fifty-eighth Congress, second session.

No action was taken on the matter by the Fifty-seventh Congress, as the papers were not received until near the close of the session. The bill now pending was introduced in both the Senate and the House on January 18, 1904, and was referred, in both houses, to the Committees on Claims. Hearings were held before subcommittees of both committees, at which representatives of the contractors were examined. Rear-Admiral Ramsay and Lieut. Commander John R. Edwards (who was a member of the Ramsay Board) were also examined by the Senate subcommittee, and Naval Constructor J. J. Woodward by the House subcommittee. There was also presented to the House committee a record of the examination of Rear-Admiral Melville before the House Committee on Naval Affairs in 1902. The committee hearings have been printed in the usual form.

PURPOSE OF THIS STATEMENT.

[The evidence contained in the three printed documents above mentioned occupies about 330 pages. In addition to their total length, the difficulty of obtaining a clear understanding of the case by their perusal is increased by the absence of any logical arrangement, and evidence bearing upon each separate point must be collected from a score of places in the different documents. The purpose of the present statement is to gather the material evidence together and present it in such a way that its relation to the main question will be easily apparent. The endeavor has been to make the statement as brief as is consistent with clearness. The presentation will be frankly argumentative, but every effort has been made not to exaggerate any element unduly or to alter the just proportion. The assertions herein contained are in general directly established by the evidence in the documents referred to. A few details relating to earlier torpedo boats, and to the performance in actual service of the boats in question, which are necessary to the completeness of the statement, but were not clearly brought out in the committee hearings, have been added, chiefly on the authority of public records; but the statement contains nothing which the builders are not prepared to verify beyond question.

A. THE BUILDERS' LOSS.

That the actual expenditure of the builders properly chargeable to the cost of these boats was far in excess of the contract prices, so that the builders in fact suffered a heavy loss, is not likely to be questioned.

The evidence of loss.—All of the builders except the Bath Iron Works submitted sworn statements to the Ramsay Board, in which they stated in great detail the cost of the boats built or building in their yards. This was done at the request of the board. None of the contractors submitting these statements had at that time entirely completed all their boats, and it was necessary therefore to estimate the amount required for completion. The percentage of cost thus requiring to be estimated was small, however, and subsequent experience showed that in almost all cases the estimate had been too small rather than too large. This appeared by the testimony before the Senate and House committees early in 1904.

These statements to the Ramsay Board showed an excess above the contract prices ranging from \$70,000 to \$154,000 for each destroyer, and from \$91,000 to \$114,000 for each torpedo boat. In view of the high standing and reputation of the contracting firms, such statements alone, with the corrections made by the builders after completion, would perhaps be accepted as sufficiently reliable evidence of at least the approximate cost of the boats; but the case does not stand on this evidence alone. The Ramsay Board visited the works of several of the contractors, examined their books and vouchers, which were exhibited freely, and verified the statements submitted. They also tested these statements by their own knowledge, and by such information and estimates as they were able to obtain from the various bureaus of the Navy Department.

Again, representatives of all the builders except Lewis Nixon and Neafie & Levy appeared before either the Senate or the House committee, or both, at the hearings early in 1904, and testified and were cross-examined as to the cost of the boats built by them. The builders also, in view of the fact that most of the boats had been completed since the statements were made to the Ramsay Board, submitted revised statements to the committees. This was done by all the builders except Lewis Nixon, including the Bath Iron Works and Neafie & Levy. The Nixon boats, as will appear later, were then being completed by the Government.

The Ramsay Board report.—It will be remembered that the Ramsay Board was not directed to ascertain the absolute cost of each of the boats, but merely the fair average cost. In determining this, as will be shown below, the board disregarded certain elements which increased the cost and the builders' loss. Even then the fair average cost reported by the board exceeded the highest contract price by \$83,200 for a single destroyer, and \$56,300 for a single torpedo boat. These figures mean more when we consider that the average contract price of the destroyers was only \$281,750, and of the boats \$152,920.83. The report of the board would seem to confirm beyond question the statement of the builders that the boats had cost much more than the contract prices.

Indeed, it does not appear from the evidence that either the officials of the Navy Department or the members of the Senate and House committees seriously questioned the fact that the builders had suffered considerable losses. There is much additional evidence of this fact to which no reference has here been made; but too much space has already been devoted to a point on which there is not likely to be any dispute.

B. THE BASIS UPON WHICH THE PROPOSED COMPENSATION HAS BEEN RECKONED.

Under the provisions of the pending bill the contractors would receive the difference between the sums already paid them under their contracts and "the fair average cost" as determined by the Ramsay Board. The table on the opposite page shows the amount which would thus be paid on account of each boat, and also the actual cost of the boats as reported by the contractors. It appears from that table that only one of the contractors would receive a sum equal to his actual loss. It is necessary to consider, therefore, how the Ramsay Board proceeded in fixing "the fair average cost" and why the amount so fixed is in all cases but one less than the actual cost.

Difficulty of fixing the absolute cost.—In the first place it is evident that had the Ramsay Board been directed to fix accurately the exact cost of each of the boats they must have entered upon a very long and elaborate investigation, or rather twenty-eight such investigations. Moreover, it is an exceedingly difficult task to fix with absolute accuracy the cost of such a large and complicated piece of work as one of these boats represents. For the actual cost of labor and material devoted solely to the construction of the boats, an elaborate and thorough examination of books and vouchers should give a substantially accurate result; but in the large item of indirect expense, which will presently be more fully examined, only a more or less close approximation is possible. The attempt to fix the exact cost of each boat would therefore have required an immense amount of time and labor and would, moreover, have offered more or less room for dispute and difference of opinion. The Department in preparing its instructions to the Ramsay Board doubtless desired to avoid these objections and to recommend a basis for payment determined by methods so conservative as to forestall all criticism on the score of excessive generosity.

TORPEDO BOATS.

Name of boat.	Name of builder.	Contract price with extras and deductions. ^a	Actual cost reported to committees.	Fair average cost determined by Ramsay Board.	Contractors' actual loss.	Approximate amount to be received on vessel under operation of bill. ^c
Bagley.....	Bath Iron Works.....	\$161,517.10	\$224,614.63	\$224,300.00	\$63,097.53	\$62,782.90
Barney.....	do.....	161,517.10	224,614.63	224,300.00	63,097.53	62,782.90
Biddle.....	do.....	161,517.10	224,614.63	224,300.00	63,097.53	62,782.90
Blakeley.....	Geo. Lawley & Sons.....	163,884.00	273,157.00	224,300.00	109,273.00	60,416.00
De Long.....	do.....	163,511.00	263,666.00	224,300.00	100,155.00	60,789.00
Nicholson.....	Lewis Nixon.....	167,212.14	278,827.00	224,300.00	111,614.86	57,087.86
O'Brien.....	do.....	167,212.14	278,827.00	224,300.00	111,614.86	57,087.86
Shubrick.....	Wm. R. Trigg Co.....	131,914.86	243,741.97	224,300.00	111,827.11	92,385.14
Stockton.....	do.....	127,861.86	243,741.97	224,300.00	115,880.11	96,438.14
Thornton.....	do.....	131,140.50	243,741.97	224,300.00	112,601.47	93,159.50
Tingey.....	Columbian Iron Works.....	168,770.45	289,491.21	224,300.00	120,720.76	55,529.55
Wilkes.....	Gas Engine and Power Co.....	148,906.86	243,189.39	224,300.00	94,282.53	75,393.14

DESTROYERS.

Bainbridge.....	Neafie & Levy.....	\$287,985.00	\$411,673.79	\$374,200.00	\$123,688.79	\$86,215.00
Barry.....	do.....	287,985.00	411,673.79	374,200.00	123,688.79	86,215.00
Chauncey.....	do.....	287,985.00	411,673.79	374,200.00	123,688.79	86,215.00
Dale.....	Wm. R. Trigg Co.....	271,055.65	431,545.45	374,200.00	160,489.80	103,144.35
Decatur.....	do.....	265,871.25	431,545.45	374,200.00	165,674.20	108,328.75
Hopkins.....	Harlan & Hollingsworth Co.....	295,038.60	449,355.00	374,200.00	154,316.40	79,161.40
Hull.....	do.....	295,038.60	444,909.00	374,200.00	149,870.40	79,161.40
Lawrence.....	Fore River Ship and Engine Co.....	282,064.12	446,581.11	374,200.00	164,516.99	92,135.88
Macdonough.....	do.....	282,064.12	446,581.11	374,200.00	164,516.99	92,135.88
Paul Jones.....	Union Iron Works.....	294,610.00	351,783.07	374,200.00	57,173.07	79,590.00
Perry.....	do.....	294,610.00	351,783.07	374,200.00	57,173.07	79,590.00
Preble.....	do.....	294,610.00	351,783.07	374,200.00	57,173.07	79,590.00
Stewart.....	Gas Engine and Power Co.....	286,925.73	382,114.33	374,200.00	95,188.60	87,274.27
Truxton.....	Maryland Steel Co.....	287,421.25	420,341.56	374,200.00	132,920.31	86,778.75
Whipple.....	do.....	287,043.33	421,944.70	374,200.00	134,901.37	87,156.67
Worden.....	do.....	286,727.17	419,736.43	374,200.00	133,009.26	87,472.83

^a These amounts are subject to small error, as exact allowances for extras are not in all cases available.

^b Including estimate of \$5,000 for completion.

^c Taken from statement to Ramsay Board. No report to committees.

However this may have been, it will presently appear that if the builders are satisfied with the compensation proposed, the Government ought certainly to be content with the amount.

The instructions to the Ramsay Board were as follows:

Method followed by the board.—The board will confer with such of the contractors as may be necessary, examine books and vouchers, take sworn statements or affidavits, and report to the department what has been the proper average cost of each class of vessel, torpedo boat and torpedo-boat destroyer, including all direct charges of material and labor and all proper indirect expenses, but excluding all profit, calling upon the bureaus of Equipment, Ordnance, Construction and Repair, and Steam Engineering, and their representatives at the yards of the various contractors, for such additional information as may be necessary in the premises.

In pursuance of these instructions the board requested of all the contractors itemized statements, verified by affidavits, showing separately the cost of the labor and material which entered into the various parts of the boats, and also the charge for indirect expense. Such statements were furnished by all the builders except the Bath Iron Works. The reason for this exception will presently be stated.

After receipt of the sworn statements the board visited the works of four of the contractors and verified the statements of the cost of material and labor by a thorough examination of books and vouchers. The statements of cost were further verified as to certain portions of the work by estimates obtained from the bureaus of the Navy Department. These estimates covered the proper cost at that time of the engines, boilers and other machinery, the electric plant and the outfit other than electric plant.

The statements of the builders having been thus verified, the board fixed from these statements the average cost of material and labor for the destroyers, and similarly for the torpedo boats. To this it was necessary to add the proper amount for general expense and for the cost of trials.

The element of general expense.—The matter of indirect or general expense is evidently the one in which there is most room for difference of opinion. This element of cost includes a large number of items not properly chargeable to any one piece of work. A manufacturer who is to do business without loss must evidently include somewhere in his estimates of the cost of his product every kind of expense which is necessary to the businesslike conduct of a complete establishment. Among these expenses are the salaries of general officers, clerks, stenographers, engineers, firemen, foremen, and superintendents; office expenses, taxes, insurance, freight, power, light, heating, water rates, depreciation of plant and buildings, repairs, advertising, legal charges, telegraph, telephone, etc. The total amount of such expenses will, of course, vary more or less from month to month in any one establishment, and their proportion to the direct cost of material and labor will vary very largely between different establishments. Moreover, the proportion of the general expense which theoretically belongs to any particular piece of work will depend upon the total amount of work which happens to be at the time going on in the yard.

In practice it is customary to add to the direct cost of material and labor a certain percentage for indirect expense. In some establishments this percentage is reckoned upon the total cost of material and labor, in others upon the cost of labor alone. The size of the percentage is, of course, determined by a comparison between the total amount of general expense and the total amount of expense for labor and material or for labor alone.

The percentages which each of the builders of these vessels had thus found it necessary to charge against each piece of work naturally differed very widely according to the size of their establishments and the amount of work on hand. There was, moreover, some difference in practice as to the items included.

In determining what allowance to make for indirect expense the Ramsay Board gave a hearing to the contractors, in which the matter was thoroughly discussed, considered the items which in their opinion should properly be included, and finally fixed upon the percentage which they considered proper.

No list of the items allowed which purports to be strictly accurate is available, but Admiral Ramsay stated that the board did not allow all the items claimed; and the comment of the bureaus of Construction and Repair and Steam Engineering upon the report of the board contains the following enumeration: "Foremen, superintendence, office expenses, taxes, insurance, freight, power, lights, depreciation of plant and buildings, water rates, etc."

The percentage finally fixed by the board was 45 per cent of the cost of labor alone for the destroyers and 50 per cent for the torpedo boats. These allowances were exceedingly conservative, being substantially the lowest adopted in practice by any of the contractors. The board was probably anxious to err, if at all, on the side of caution. This comparatively small allowance for general expense made "the fair average cost" as reported by the board considerably lower than the average actual cost as shown by the sworn statements of the contractors. It must be noted that the board did not attempt to find the average of the percentages properly charged by the builders, but merely fixed a conservative allowance based upon the practice of the older establishments.

Estimate for cost of trials.—To provide for the cost of the trials the board determined the proper cost of a single trial, both from the contractors' statements and from their own knowledge of the subject, and fixed also upon what they considered a reasonable number of preliminary and official trials. Here again no attempt was made to average the actual number of trials which had proved necessary for such of the boats as had then reached the trial stage.

It should be clearly understood that the estimates of the board excluded all interest on invested capital and all profit. The same is true of the builders' statements, both to the board and to the committees.

Summary.—The reasons for the discrepancy between "the fair average cost" as reported by the board and the average actual cost reported by the contractors are, therefore, the following:

In the first place, the board adopted a very conservative percentage for indirect expense.

In the second place the number of trials for which the board allowed was considerably less than actually proved to be necessary for the majority of the boats. Here was a large element of loss, therefore, which the Ramsay Board did not take into account. The causes of this loss will presently be stated, and it will then appear that the Ramsay Board might properly have included it in an estimate of "the fair average cost." It was, however, no part of the duty of the board to investigate the causes of the loss, and here again they adopted the conservative course. Moreover, as comparatively few of the boats were then completed, the data were not available for fixing the average number of trials.

Finally, since the investigation was made before most of the boats were completed, the expense of completion had to be estimated in the builders' statements, and these estimates, largely because of the unexpected number of trials required and the unexpected delays which were encountered, proved to be inadequate.

It will therefore be seen that while the Ramsay Board's "fair average cost" is less than the actual cost reported to the committees by any of the contractors, this difference does not involve any criticism of the accuracy of the builders' statements, nor does it indicate any opinion on the part of the board as to the responsibility for the various elements of loss. This latter question the board did not consider.

It is but just to the builders to add that they have at every stage courted the fullest investigation. Admiral Ramsay told the Senate committee that the contractors had offered to his board every facility for a thorough examination. The only exception to this statement appeared in the case of the Bath Iron Works. This exception was afterwards explained by Mr. Hyde, the vice-president of the company, to the committees, and the explanation should be stated here.

The case of the Bath Iron Works.—At the time these contracts were awarded the Bath Iron Works were already building two torpedo boats for the Government. When this earlier contract was undertaken the officials of the company, knowing that foreign governments had built large numbers of torpedo boats, expected that this Government also would in course of time add a great many such boats to the navy. Desiring to make a successful record with their first boats and thus obtain a legitimate advantage which would assure them future contracts, the Bath Iron Works at great expense purchased plans and information from the leading French builder of torpedo boats. By this means they were enabled to accomplish results of unusual excellence both with their first two boats and with those which they built under the act of 1898. At the time of the Ramsay Board investigation they still hoped to receive in the future many other contracts for torpedo boats, and they thus hoped in time to make up their losses. Meanwhile they considered it better business policy to withdraw their request for direct compensation, rather than disclose publicly the secret of their success.

When the committee hearings were held, two years later, the officers of the company had come to the conclusion that their expectations were likely to be disappointed, and that those who directed the country's naval policy had no present intention of making any considerable additions to the existing fleet of torpedo vessels. Under such circumstances there was no longer any reason for seeking to retain the advantage which they had secured by the purchase of valuable information, and they joined in the application to Congress, making full disclosure at the committee hearings of the method they had adopted.

We may now return to the results of the Ramsay Board investigation.

Propriety of the method adopted.—The propriety of fixing the compensation to be paid the builders on the theory of an "average cost" might perhaps have raised some question had the result involved the payment to several of the contractors of amounts largely in excess of their actual losses. In fact, however, as shown by the table on page 13, the Union Iron Works is the only contractor which would receive more than the actual cost of its work; and in that case the excess is only about \$67,000 for three boats, as against a total outlay by the company of \$1,055,349.22. The boats of the Union Iron Works were completed in May, June, and July, 1902, and that company has already paid interest on a total loss of \$171,519.21 for over two years and a half. Altogether, it can not be said that the Union Iron Works would grow rich by the operation of this bill.

But there is a more important consideration in this connection. All the other contractors would receive sums less than their actual losses, and six of the eleven would still have a loss of over \$100,000 each. The entire amount carried by the bill can hardly be criticised from the standpoint of the Government, since it is almost a million dollars less than the total loss of the contractors. Under these circumstances it would seem that no one except the builders has any occasion to object to the unequal operation of the method employed. As for the builders, they fully appreciate the promptness with which the Navy Department met their request for relief and set about the necessary investigation, and they are not disposed to be critical of the method which the department adopted. Meanwhile it was naturally felt that the amounts established by this thorough official investigation furnished the most satisfactory basis upon which to fix the compensation proposed to be given under the pending bill.

We may therefore assume that if it shall appear that the builders are entitled to be compensated for their losses, no question will be raised as to the amount of compensation provided in the present bill.

Outline of following discussion.—The real controversy, if any, will be on the question whether the loss was of such a character and sprang from such causes that the builders may properly ask the Government for relief.

In this connection the principal subjects which we shall consider are the nature of the problem which the Navy Department and the builders undertook to solve in the construction of these boats; the conditions which rendered accurate estimates of the cost in advance impossible; the causes which operated to increase the cost far beyond the expectations of the builders or the department; the opinions officially expressed upon various phases of the case by officers of the Navy Department and the navy; and the value of the results to the Government.

C. THE DIFFICULTY OF THE PROBLEM.

The torpedo boats and destroyers to which the pending bill relates were authorized by the naval appropriation bill of May 4, 1898. (Ch. 234 of the Statutes of 1898; 30 Stat. L., 369, 389.) The act provides for the construction by contract of 16 torpedo-boat destroyers of about 400 tons displacement, and 12 torpedo boats of about 150 tons displacement, to have the highest practicable speed, and to cost in all, exclusive of armament, not exceeding \$6,900,000.

The advertisement for bids was dated July 3, 1898, and the bids were opened August 23 of the same year.

One of the most important elements in the case for the contractors, if not the foundation of the whole case, is the claim that they undertook, in common with the Navy Department, the solution of a new problem, and that their own inexperience and that of the department justify, in a large measure, both the inadequacy of the bids and the abnormal cost of the boats. It is therefore necessary to a fair understanding of the case to examine with some care the stage which had been reached at the time the contracts were undertaken in the development of torpedo-boat construction. In this connection it will be necessary to state a number of details relating to the earlier torpedo boats built in this country, whose bearing upon the present question may not be at once apparent. It will appear, however, as the discussion proceeds, that these facts have a very material bearing, and in the end both brevity and clearness will be served by stating all the necessary facts in regard to the earlier boats at this point.

Development of the type abroad.—In the building of modern torpedo boats and destroyers foreign nations had preceded the United States. The French navy, for example, in 1898 had more than 200 torpedo boats built or building. The destroyer, which is a type similar to the torpedo boat in construction and purpose, distinguished only by its larger size, greater seagoing capacity, and by such incidental differences in construction as this involves, had been originally developed in England, beginning about 1892. In 1892, 1893, and 1894 some 42 destroyers were ordered by the English Government. By the 31st of March, 1901, 90 English destroyers had been completed.

But in spite of this extensive construction of both types of boat by foreign countries, they were still regarded as more or less in an experimental stage. Their usefulness in warfare had not yet been tested. The latest ones, completed in 1898, had been ordered before there had been an opportunity fully to test the merits of the earlier ones. The original tendency was to sacrifice nearly everything else to speed, with the result that the completed boats developed some serious faults.

Previous American boats.—This Government had been much more conservative, and had refrained from ordering large numbers of these boats while their construction was still in an experimental stage. Only 11 boats of this general type had been completed for the United States Navy in the summer of 1898, the time now under consideration. These were all torpedo boats. As compared with the boats authorized by the new act, 6 of the 11 were much smaller and of a much lower speed. The other 5, in speed and displacement, more nearly resembled the new boats. These 5 were the *Foote*, *Rodgers*, and *Winslow*, having a trial displacement of 142 tons and a speed between 24 and 25 knots, and the *Porter* and *Dupont*, having a displacement of 165 tons and a speed of about 28½ knots. In all these boats, however, speed had been secured at the expense of other important qualities.

The peculiarity of the torpedo boat and the destroyer is, of course, their high speed and their relatively small size. This necessitates extremely powerful engines in proportion to the size of the boats. At the same time, the weight of hull, machinery, equipment, and everything which goes into the boat must be kept as low as possible, since obviously the heavier the boat, other things being equal, the more difficult it will be to drive her through the water at the desired speed. It is evident that a builder who is required by his contract to attain a certain speed, and who is to receive, moreover, a price subject to penalties for falling below the contract speed, is required to reduce in every way possible within the specifications of his contract the weight of every part of the vessel. While the construction must of course be sufficiently strong to stand the strain of the speed trials, it may still leave much to be desired from the point of view of durability and serviceability. Moreover, the equipment of such boats

includes a multitude of various appliances which have little or nothing to do with the speed of the vessel, but each of which has its proper and necessary use in service. The fittings, furniture, etc., and all the provisions for comfort and habitability form another necessary part of the construction. Again, the carrying capacity, particularly for coal and water, is an important element in serviceability. In all these particulars of fittings, equipment, and miscellaneous appliances, the builder will necessarily seek to reduce the weight to the lowest possible minimum, thus to some extent sacrificing efficiency of equipment, carrying capacity, convenience, comfort, and habitability to the highest possible speed.

Nor are the builders of the earlier boats to be criticised for this. They were simply doing their best to secure the results which the department in placing the contracts made of first importance. These were the first high-speed boats built in this country, and their building was experimental. The results which they obtained were, doubtless, the best which were possible, considering the inexperience of the builders and the department in an exceedingly difficult and special line of work. Indeed, similar faults developed in contemporaneous foreign boats.

Certain of the conditions under which these earlier boats had been constructed are important. In the case of the *Foote*, *Rodgers*, and *Winslow* the Government had prepared outline plans and general specifications, but left the builders to work out the multitude of details. In the case of the *Porter* and *Dupont* the Government prepared no plans and practically no specifications. The builders made their own plans and worked out the details themselves, with comparatively little supervision from the government inspectors. In all five of these boats the builders contracted in substance simply for results, and speed was almost the only requirement. They performed their contracts in their own way, and obtained the results for which they contracted, and the boats were accepted.

Faults of the earlier boats.—The performance of these boats taught the department, however, the wisdom of emphasizing other requirements besides speed. In the *Porter* and *Dupont* the lightness of the hulls and fittings had been pushed to the extreme. The strength of their hulls was criticised by the department experts, and their fittings and equipment were unsatisfactory. In the case of the *Foote*, *Rodgers*, and *Winslow* the faults were similar, being chiefly, however, in the efficiency and convenience of the equipment, the carrying capacity, and the general comfort and habitability of the boats. These faults were so serious that a great many changes were made in the boats by the Government after they had been in commission, all resulting in increase of weight and consequent diminution of speed.

Other boats under construction in 1898.—In addition to the eleven torpedo boats which had been completed before the summer of 1898, when the contracts affected by the pending bill were awarded, there were already under construction ten other boats of his general type. While all of these were rated as torpedo boats, four of them more nearly approached in size the English destroyers. These were the *Farragut*, *Stringham*, *Goldsborough*, and *Bailey*. The contract for the *Farragut* contemplated a displacement of "about 273 tons;" but this was not binding upon the builder, and her actual trial displacement when completed was only 236 tons. The contract displacement of the *Stringham*, *Goldsborough*, and *Bailey* was, respectively, 340, 247½, and 280 tons. The first group of English destroyers, ordered in 1892–1894, averaged 267 tons, and those ordered in 1895 and the few years following averaged just about 300 tons. The new American destroyers, authorized by the act of 1898, were to be boats of about 420 tons. The *Farragut*, *Stringham*, *Goldsborough*, and *Bailey* were, therefore, of a type corresponding to the English destroyers, but midway between the two kinds of boats authorized by the act of 1898.

Neither these four boats, however, nor the six torpedo boats, strictly so called, which were building in 1898, had advanced far enough to furnish much information on the problems of construction either to the department or to the builders.

All these boats had been authorized before the department had had an opportunity to learn the lessons taught by the *Porter* and *Dupont*, and the *Foote*, *Rodgers*, and *Winslow*, and the contracts for them showed the same tendency to an increase of speed requirements at the expense of other qualities which marked the English boats ordered about the same time. The *Fox*, *Davis*, and *Mackenzie*, small torpedo boats, had a comparatively low contract speed, but the *Rowan*, a boat of 182 tons, and particularly the *Dahlgren* and *Craven*, of 146 tons, had very high speed requirements. In the case of the *Dahlgren* and *Craven* the contract speed was 30 knots, which was the same speed required of contemporary English destroyers. The *Farragut*, *Stringham*, *Goldsborough*, and *Bailey* were also to be 30-knot boats, and in the case of the last three this was required by the act of authorization. The subsequent experience of these boats, although it does not properly belong in a discussion of the conditions prevailing at the time the bids for the new contracts were sent in, throws so much light on the general question that it may as well be referred to at this point.

Success of the Dahlgren and Craven.—The *Dahlgren* and *Craven* were built by the Bath Iron Works. They attained the required speed and proved to be efficient and satisfactory boats. It must be noted, however, that these boats were designed only for harbor service, and in that respect differed materially from the torpedo boats authorized in 1898.

Moreover the contractors were enabled to accomplish their very successful result only by availing themselves of the knowledge and skill gained by the leading French builder of torpedo boats in twenty-five years of experience. As already stated, the officials of the Bath Iron Works expected that this Government would sooner or later build a great many torpedo boats, and desired to make a record with their first boats which would give them a legitimate advantage over other builders and assure them contracts for future boats. They looked over the whole field and determined that M. Normand, of Havre, France, had produced up to that time better results than any other builder of torpedo boats in the world. M. Normand had been building such boats for a great many years, and had successfully constructed several hundred. The Bath Iron Works therefore purchased from him for the *Dahlgren* and *Craven* the plans, complete in every detail, of a torpedo boat then under construction by the French builder. In addition to the purchase of these plans the vice-president of the company and one of his expert employees went to France and remained at the works of M. Normand several weeks, studying every detail of torpedo boat construction. The advertisement for bids for the *Dahlgren* and *Craven* simply called for two torpedo boats of the highest practicable speed, leaving all plans and details to the builder. The contractors were therefore enabled to follow the plans of the French boat, and were given practically a free hand in the work of construction. It is not surprising that these methods enabled them to accomplish results which no other American builder was able to equal. It was practically as if builders without any experience had been competing with M. Normand himself.

The Bath Iron Works had not secured this advantage without paying for it a very large price, which they hoped to make good in the course of time by the construction of a great many boats for the American navy. Moreover, the contract price for the *Dahlgren* and *Craven* per ton of displacement was 40 per cent larger than that of the most expensive boat for which the Government had contracted up to that time, about 75 per cent more than the average price per ton of the boats previously built or authorized, and 10 per cent more than the fair average cost per ton of actual displacement as afterwards fixed by the Ramsay Board for the torpedo boats authorized in 1898. Even then the Bath Iron Works lost money on their contract for the *Dahlgren* and *Craven*, for which they do not ask any reimbursement.

Experience of the other 30-knot boats.—The other 30-knot boats which were building in 1898 show entirely different results. The *Farragut* had great difficulty in fulfilling her contract requirements. She finally succeeded in making the required speed, but this was accompanied by excessive vibration, and her hull was so light as to be criticised by the department officials for insufficient strength. The *Stringham*, *Goldsborough*, and *Bailey* were even less successful. The *Goldsborough* repeatedly failed to make her speed, and her builders finally became involved in financial difficulties so that the Government was compelled to annul the contract and take over the boat for completion. The *Stringham* never succeeded in making the required speed, and has not yet been accepted. The *Bailey* was completed and accepted, but her speed had been accomplished at such a sacrifice of strength as to necessitate extensive alterations by the Government after a short experience in service. These changes undoubtedly resulted in reducing her speed considerably below 30 knots.

Navy Department's change of policy.—We may now return to the conditions prevailing at the time the bids were invited for the new boats. The department had already begun to learn from the experience of the *Porter* and *Dupont*, and the *Foote*, *Rodgers*, and *Winslow*, some of the lessons which were afterwards so powerfully enforced by the *Farragut*, *Stringham*, *Goldsborough*, and *Bailey*. Accordingly the policy of the department was changed in two important respects. The highest possible speed was no longer regarded as so important as to dwarf all other considerations. The advertisement for bids specified as the lowest acceptable speed 28 knots for the destroyers and 26 knots for the torpedo boats. This change was made in order to make possible greater strength, rigidity, and durability of construction. As stated by Naval Constructor Woodward to the House committee such a reduction of the speed requirements was not only justified but demanded by the behavior of the *Porter* and *Dupont* upon trial. It has since been further justified by the experience above related of the other high-speed boats.

It is interesting to note that a similar change of policy took place soon afterwards in England. For the three years preceding 1898 the English Government had been ordering destroyers of a speed of 30 knots; but in those ordered a year or two later the speed requirement was reduced to 25 and 26 knots, for reasons similar to those which

influenced our own Navy Department. There, as here, it was found that the highest speed was purchased only at the expense of other important qualities.

Increase in miscellaneous requirements.—Had the only change in policy been a reduction of speed requirements in favor of strength the problem would have been much less difficult than it was. But the attention of the department had been called very forcibly to the other elements of equipment, carrying capacity, convenience, comfort, and habitability, in which the earlier boats were deficient. Accordingly the requirements for the new boats were made much more exacting along all these lines. The matters of equipment in which the standard was thus raised included not only those things coming within the jurisdiction of the Naval Bureau of Equipment, but nearly everything about the hull and machinery which is not directly related to the speed of the boat. All these changes in the specifications resulted in greatly increasing the total weight, aside from the hull and main engines. All this added weight must be driven through the water, and either there must be a corresponding reduction in the weight of the engines and hull, or the power of the engines must be greatly increased.

It must be evident from what has already been said that even with all other elements of construction cut down to the lowest possible limit the problem of building the engines and hulls so as properly to combine lightness, strength, and power is a problem of the greatest nicety. The *Porter* and *Dupont* were the only vessels previously completed in this country in which these elements had been so balanced as to secure a speed equal to that required of the new boats, and in their case there had been some sacrifice of strength. In the new boats greater strength of construction was demanded, which increased the difficulty of the speed problem, though probably no more than the reduced speed requirements would compensate. But when the total weight was greatly increased by requirements of equipment, carrying capacity, convenience, habitability, etc., having no relation either to speed or strength of hull, a new element was brought into the problem. These requirements were not only much greater than in the case of the boats previously completed, but considerably greater than in those under construction, including the *Dahlgren* and *Craven*, which were essentially harbor-defense and not seagoing boats, and considerably greater than in contemporaneous foreign boats. It followed that the added strength in the hulls must be secured with as little additional weight as possible, and that additional power must be provided in the engines. The great increase in the difficulty of the problem which these all-round requirements involved is best illustrated by the fact that while the horsepower of the engines was thus increased, as compared with previous boats designed by the department, they were required to be at the same time even lighter in weight than previous engines of smaller horsepower.

This meant an entirely new and much more difficult problem of construction.

New materials and designs required.—To secure the necessary results in the engines the specifications called for a kind of material which had never before been applied to this use. The forgings which make up the greater part of the machinery were required to be made of nickel steel in place of carbon steel, which had previously been used. The improved quality of the steel allowed a lighter construction, but introduced new difficulties. The manufacture of nickel steel was comparatively a new art, and the material was not only much more difficult to make but also much more difficult to work. Again, the plates for the hulls required to be made of steel possessing an unusual degree of ductility and tensile strength, and the specifications in this respect were more exacting than in the case of previous boats, requiring a higher quality of steel than had previously been manufactured for such a purpose. Such plates were both very expensive and very difficult to manufacture.

Nor were these improvements in the quality of material alone sufficient to meet the difficulties of the problem. Every part of the boats had to be specially designed in order to obtain in the hulls the greatest possible degree of lightness and strength, and in the engines not only to secure these qualities, but also to balance them so accurately as to reduce the vibration as much as possible, and at the same time construct all the complicated machinery so as to occupy the smallest possible space.

In a word, in order to secure such improvements as were desired over the results obtained by the best efforts of the builders of previous boats, it was necessary to use entirely new materials and entirely new designs.

The only experience in this country on which the department or the builders could rely for assistance in the solution of this problem was that of the first eleven boats, notably the *Porter* and *Dupont*, and the *Foote*, *Rodgers*, and *Winslow*, and it was the faults of these very boats which the Government proposed to correct in the new designs.

Since the department and the builders were thus undertaking the solution of a new and difficult problem, it is important to consider how far the attempt had been made to work out the problem in advance.

Method adopted as to plans and specifications.—It is stated in several of the official documents relating to the present case that bids for these vessels were invited on the Navy Department plans and also on the bidders' plans, and that part of the boats were built on the department plans and part on the bidders' plans. This does not mean that the department furnished to the contractors a complete set of detailed plans upon which to make their bids. In the course of the construction of one of these boats there have to be prepared not only a large number of plans showing the general design and construction of the boat, but also detailed drawings of every separate portion of the hull, machinery, and electrical and other outfit. The total number of drawings required is somewhere in the neighborhood of a thousand, and their preparation is the work of many months. In fact, one of the contractors testified that the preparation of the necessary detailed plans required about one year's continuous work of 50 men. The Navy Department did not attempt to prepare any considerable portion of the total number of drawings, but furnished the contractors with a set of outline plans consisting of some half dozen sheets of drawings, and a printed set of specifications.

The specifications, like the plans, were not fully worked out. They covered the general dimensions, with a general description of the parts required, the arrangement, and general mode of construction. As we have seen, they defined to a certain extent the quality of the material required. But as to the great majority of the details the provision was that they should be "as directed" by the department officials, or of a design "to be approved" by the department. Even in the quality of the material more or less room for discretion was left to the government inspectors.

When it is said that several of the contractors were awarded contracts upon their own plans, this again refers only to the general plans corresponding to those furnished by the department, and it must be remembered that if the contractor made any changes in the Government's designs the plans were classed as his own. Of the six successful bidders for torpedo boats, two bid upon their own plans. These were Lewis Nixon and the Bath Iron Works. In the case of Lewis Nixon the departure from the Government's plans was not very extensive, relating chiefly to the arrangement of machinery. The Bath Iron Works bid upon designs entirely their own. Of the successful bidders for destroyers, four received contracts upon the department's plans and three upon their own plans. These latter were the Fore River Ship and Engine Company, the Harlan & Hollingsworth Company, and the Maryland Steel Company. Their designs were modifications of the department's plans rather than entirely original plans, though some of the departures were considerable. Contractors who bid upon their own outline plans were, however, equally subject with the others to the direction and approval of the department officials in regard to all of the multitude of details covered by the specifications.

In each of the yards, during the construction of the boats, the Navy Department had an inspector of the hull, an inspector of machinery, and an inspector of equipment, and they had many assistants. The detailed drawings were prepared by the builders as the work progressed, and each one must be approved by the department's inspector before it could be used. The inspectors had their own ideas, which might not agree with the builders', and many of the drawings had to be sent to Washington to be passed on by the department officials there.

The Bath Iron Works followed as far as possible the plans they were using for the *Dahlgren* and *Craven*, but their new boats were somewhat larger, having a contract displacement of 157 tons, as compared with 146.4 tons for the *Dahlgren* and *Craven*, and the requirements in nearly everything except speed were more exacting. Moreover, they were equally subject with the other bidders to the approval of their detailed drawings by the government inspectors or the department, and to the interpretation of the specifications by these inspectors.

Increase of requirements during construction.—This language in the specifications, requiring that nearly every detail should be "as directed," had been customary in previous naval contracts, though in the case of some of the torpedo boats, notably the *Porter* and *Dupont*, there had been almost no specifications. But in no case had the power which such specifications gave to the government inspectors and the Navy Department been exercised to anything like the same degree as in the construction of the boats now in question.

As we have seen, it had been the policy in the past to give the builders practically a free hand in obtaining the results which the contract required. But the builders could not count upon a continuation of this policy, and, as a matter of fact, as will be shown more fully below, the department adopted a new policy in connection with these boats. Recognizing the increased difficulty of the problem, and desiring also to guard against a repetition of the faults which had been noted in the earlier boats, the department officials exercised a much more rigid supervision over every detail of design and construction than had been customary in the past. This enabled them

to take advantage of the new lessons which were continually being learned from the experiences of the boats already in commission, while the new boats were under construction. Defects in the details of equipment, fittings, etc., particularly in the *Foote*, *Rodgers*, and *Winslow*, from time to time came to the notice of the department, and as a result the supervising inspectors were constantly instructed to require this, that, or the other part of the new boats to be constructed in a particular way. Strength, convenience, comfort, and habitability were thus continually emphasized, and new requirements introduced under the general language of the specifications in the light of new experience.

Summary.—The conditions prevailing at the time when bids were invited for the new contracts may then be summed up as follows: The department desired to accomplish results considerably in advance of any which had previously been attained in this country. They had, as a guide, the experience of only 11 boats, and of these only 5 approached sufficiently the size and speed of the new torpedo boats to be of any assistance. The art of building torpedo boats and destroyers, still more or less experimental abroad, was in its infancy in the United States. The problems were still to be worked out. The department itself had still to learn their solution. The navy officials did not attempt to prepare in advance more than the most general plans and specifications for these boats. The principal difficulties were yet to be solved in the course of the construction. It is not surprising that, as we shall see, the department's general designs proved to be in some respects faulty, and their calculations as to speed and displacement somewhat inaccurate.

The builders were in even a worse position than the department, for, as will appear below, only one of them had previously completed a torpedo boat, and the four who had boats of this general type under construction had not advanced sufficiently to obtain much experience of value.

The difficulty of the problem is very well expressed by Messrs. Linnard and Chandler in their report to the Bureau of Construction and Repair, after inspecting the boats under construction, in November, 1901. This report says:

"With the exception of the Bath Iron Works, which bid on its own designs, and the Columbian Iron Works, which subsequently went into the hands of a receiver, none of the contractors had previously completed torpedo vessels. At the time the contracts were let the Gas and Engine Power Company had the torpedo boat *Bailey* under construction, but were not far enough advanced with her to have gained valuable experience in the matter. The torpedo boats previously built had been generally of much smaller size and much lower requirements as to speed, and it is believed that those who built them (except perhaps the Herreshoff Manufacturing Company) had had considerable difficulty in their completion. The building of successful torpedo vessels having the 'highest practicable speed' is an occupation that requires designing talents of a high order and prolonged experience in construction. There are comparatively few successful builders of torpedo vessels in the world; but the attempt was made in this country to rival the best results attained abroad with designs which were not based on the known results of a large number of previous vessels, and by builders whose knowledge and experience were of a limited character."

D. THE IMPOSSIBILITY OF ACCURATELY ESTIMATING THE COST.

Having thus examined the nature of the problem confronting the department and builders, we shall not find it difficult to understand the inaccuracy of the estimates of both builders and department as to the cost of these vessels.

The advertisement for bids.—As already stated, the act of authorization fixed a maximum price of \$6,900,000 for the 28 boats. Having in mind the total amount of the appropriation and the necessity of providing out of it for the department's expenses in connection with the boats and for the payment of extras, the Secretary of the Navy, in his advertisement for bids, named an upset price of \$295,000 for each of the destroyers and \$170,000 for each of the torpedo boats. The bidders were also furnished with the Government's outline plans and with such general specifications as have been described above. In the matter of displacement, the department's circular notified them that the destroyers must not be under 400 tons nor over 435 tons, and that the torpedo boats must not be under 150 tons nor over 170 tons. As to speed, 28 knots must be guaranteed for destroyers and 26 knots for boats. The destroyers must be constructed within eighteen months and the boats within twelve months, and penalties were provided for delay beyond this time. No premiums were offered for speed above the requirements, but the bidders were notified that they might guarantee a higher speed, and that this would be given weight by the department in awarding the contracts.

The act of authorization provided that not more than five of the destroyers and not more than four of the torpedo boats should be built by one contracting party. It was evidently the intention of Congress that the contracts be distributed as widely as possible. The act also provided that the contracts should be awarded by the Secretary of the Navy to the lowest best responsible bidder, having in view the best results and most expeditious delivery.

Fourteen firms submitted bids within the time allowed, and eleven of them received contracts. Of the other three firms, Richard B. Painton & Samuel H. Randall were not shipbuilders and had no plant; John H. Dialogue & Son had no experience with this class of work, and the Wolff & Zwicker Iron Works had already three torpedo boats under construction for the Government, taxing the capacity of their yard. The 11 successful bidders are the companies and firms already enumerated, for whose relief the pending bill is introduced.

Inexperience of the bidders.—It is hardly necessary to say that in making bids for the construction of naval vessels the builders are ordinarily guided by their own past experience in building boats of a similar class. They have figures showing with very close approximation what such boats have cost them in the past, and these figures form the basis of any bid they may make for new work. Other elements doubtless enter in. They may be able to see where they can profit by their past experience and cut down the cost in certain places. They have to consider any changes that have taken place or are likely to take place in the cost of labor and materials. They have also to consider such differences as there may be between the boats for which they are bidding and those they have previously built. The designs of battle ships and cruisers, for example, have doubtless varied considerably as naval architecture generally, and in this country in particular, has progressed; but such changes and developments are not comparable with the difference between battle ships, cruisers, and gunboats on the one hand and torpedo boats and destroyers on the other.

In the present instance the successful bidders had almost no previous experience with similar boats to guide them. The Columbian Iron Works was the only one which had previously completed any torpedo boats. The Gas Engine and Power Company, Bath Iron Works, Union Iron Works, and Harlan & Hollingsworth then had torpedo boats under construction.

The boats previously built by the Columbian Iron Works were the *Foote*, *Rodgers*, *Winslow*, and *McKee*. The *McKee* was only a 65-ton vessel, with a speed just under 20 knots. The *Foote*, *Rodgers*, and *Winslow* have already been described. They were 142-ton vessels, with a speed between 24 and 25 knots. The new contract awarded to the Columbian Iron Works was for one torpedo boat, the *Tingey*, with a contract displacement of 165 tons and a contract speed of 26 knots. The principal difference between the *Tingey* and the boats previously built by the same company was not, however, in displacement or speed, but, as already shown, in the greatly increased requirements as to equipment, carrying capacity, convenience, and habitability, making the problem of construction much more difficult and complicated and requiring a new kind of materials and entirely new and greatly improved designs. As we have seen, the detailed plans for the new boats were not worked out at the time the contracts were placed, and this fact alone made it impossible for the Columbian Iron Works to estimate the increase of cost which the difference in type would involve.

The entire lack of proportion between the cost of the two types of boat is indicated by the fact that the contract cost per ton of the *Foote*, *Rodgers*, and *Winslow* was approximately \$687, while the average contract price per ton of the new torpedo boats was \$934.32, and the contract price per ton of the *Tingey* was \$1,018. Subsequent experience showed that even this amount was entirely inadequate, the proper average cost per ton fixed by the Ramsay Board for the torpedo boats (taking the actual displacement of the boats as completed) being just about \$1,200.

As already stated, the torpedo boats under construction at the time the new contracts were placed were not very far advanced, and the four contractors above named who were already building torpedo boats had not yet had an opportunity to gain much experience which could be useful to them in estimating the cost of the new boats. Harlan & Hollingsworth and the Gas Engine and Power Company had but shortly before laid the keels of the vessels called for by their earlier contracts. The Union Iron Works and the Bath Iron Works had but shortly before reached the launching stage. Roughly speaking, this means that the latter vessels were about half completed. But they were the first torpedo boats which their builders had undertaken, and it will be readily understood that in a work requiring such nicety of adjustment in all details and such care and perfection in design, the inexperienced builder must be very near the completion of his work before he can tell with any degree of accuracy how successful he has been and how much his total cost will be.

It thus appears that of the eleven successful bidders six had never before attempted to build either torpedo boats or destroyers; four had entered upon the construction of torpedo boats, but had not yet proceeded far enough to acquire sufficient information for estimating cost; and one only had previously completed torpedo boats, but of a smaller size and much less expensive and difficult type.

It may be added that the destroyers differed materially from any boats previously built in this country, or, indeed, in England, in the matter of displacement. Their contract displacement ranged from 400 to 433 tons, whereas the largest English boats completed down to March 31, 1901, were only 334 tons. The nearest approach to the new destroyers in this country was the *Stringham*, with a contract displacement of 340 tons, whose keel had just been laid by Harlan & Hollingsworth.

Absence of detailed specifications.—But inexperience was not the only difficulty which the builders encountered in making their estimates for these boats. As we have seen, only the most general plans and specifications were furnished them, and all the details of construction, involving great difficulties of design which required the highest skill for their solution, had yet to be worked out. A contractor who bids for naval work must form such estimate as he can, from the general plans and specifications, of the amount and nature of the work to be done. If he has previously constructed vessels of a similar class, and particularly if the vessel belongs to a type in which the principal problems of construction have been thoroughly worked out in the past, he can form a very accurate idea of the details as they will develop. If the type of boat is entirely new to him, and especially if it is a type still in process of development, the general plans give him comparatively little assistance. Until the detailed drawings have been prepared, only the most general idea can be formed of the number, size, and form of the multitude of forgings and castings required and the amount of labor involved in working them and putting them together.

Other elements of uncertainty.—Moreover, in their working out of these details the contractors were subject to the approval of the government inspectors, and the specifications left a very wide margin within which the requirements as to a multitude of matters were to be subsequently specified. The designs, so far as they were furnished, were of a very special and peculiar type, and it was known that in all their details these boats would be special and unlike any other type of boat. Even the materials specified were new, and the builders had no experience in working with such materials, nor could they judge what their cost would be, as thus applied for the first time to this use. Finally, only sixty days was allowed them in the advertisement for bids within which to make their estimates and prepare their bids.

Foreign prices not reliable.—Since they had no past experience on which they could rely, it is necessary to consider what other sources of information were open to them. The first which naturally suggests itself is the experience of foreign builders. As already stated, foreign nations, notably France and England, had built a large number of these boats. The destroyer was a type of boat originated and developed in England. While American firms would have had considerable difficulty in obtaining detailed information from these foreign builders, except by paying a large price for it, they could doubtless have ascertained the contract prices paid in England for the building of boats of this general type. In France the figures are not published, and would be more difficult to obtain. But it does not follow that the bidders could safely have relied upon any estimates based upon foreign prices.

In the first place, as we have seen, the English destroyers differed considerably in size from any American boats, being midway between the American destroyers and the American torpedo boats. We have seen also that these English boats had developed some of the same faults which the Navy Department in this country was seeking to correct in the new boats. The English boats had in general proved to be undesirably light, and they were much less complete and comfortable in their fittings than the American boats. In other words, there was more or less of the same difference between the English boats and the boats proposed to be built in this country as between the earlier American boats and the new boats. Until the designs were worked out it was impossible accurately to estimate this difference. In a word, the building of torpedo boats and destroyers was still in process of development on both sides of the ocean. Enough has been said to indicate the difficulty which inexperienced builders would have had in selecting particular types of foreign boats as a basis for comparison.

Again, the principal elements of cost are, of course, labor and material. The act of authorization required the builders to use in the construction of these boats material of domestic manufacture exclusively. They were not at liberty to purchase anything abroad. The prices of steel plates, forgings, and castings in this country and in Europe are by no means the same, nor is there any fixed relation between them. A comparison will be presented below between the prices which the builders had to

pay for their material and the prices charged for the same material abroad. That comparison will suffice to show how unreliable the one would be as a basis for estimating the other.

The same thing holds true in regard to the cost of labor. The wages paid in this country differ widely from those paid abroad. If this were the only difference, it would be possible to form some sort of estimate from the relations between the prevailing wages; for example, in this country and in France; but there is also a considerable difference in the degree of productiveness of European and American labor. Only by experience in this particular class of work could this difference be estimated.

As we have seen, the Bath Iron Works purchased for a large sum plans and detailed information from the leading French builder of torpedo boats. Although the information thus acquired as to methods of construction proved of great value to them in the actual work of building, they found French prices for material and labor so different from those in this country as to be of no practical assistance in estimating cost.

It thus appears that an examination of foreign prices would have been as likely to mislead as to assist American builders in forming an accurate estimate of the cost of the work before them. A comparison which will be made below, between the actual cost of these boats and the prices paid for English boats ordered about the same time, shows the figures to be surprisingly close together; but this could only have been learned by experience, and could not safely have been predicted in advance.

Impossibility of obtaining options.—Another method by which it would seem at first thought that the builders might have protected themselves against at least a part of their loss was by obtaining options from steel companies for the material which they were to use in the construction of the boats. It was brought out at the committee hearings that builders ordinarily take this precaution before making bids for naval work. It was impossible for them to obtain anything more than options, for the terms under which naval contracts are awarded forbid the placing of any orders for material until the plans have been approved by the department inspectors. Even options, however, proved impossible to obtain in the case of the boats in question.

As shown above, for the greater part of the work new and special materials were required. Nickel steel was specified for the forgings and for a few of the plates, and for the remainder of the plates the specifications called for a higher quality of steel than had previously been required for such a purpose. The manufacture of nickel steel was a comparatively new process, and this was the first time it had been used to any extent in the construction of vessels in this country. Carbon steel, which had previously been used, is much less expensive and much more easily worked. Steel makers had as yet little experience with nickel steel, and prices for it had not yet become definitely established. Very few firms were ready to take contracts for it, and these were not disposed to bind themselves by giving options. The situation in regard to the plates for the hulls was substantially the same.

Moreover, practically every part of these vessels was to be of a new and special design. Under these circumstances steel concerns naturally refused to give options for forgings and castings at fixed prices until they were furnished with drawings of the forgings and castings to be required. These drawings had not been made and could not be furnished by the builders.

Some of the builders were able to obtain options for a small portion of their material, but were subsequently unable to enforce them. This, however, belongs to a different division of the discussion. It is sufficient at this point to say that none of them were able to obtain options on a sufficient quantity of the material to furnish a basis for accurate estimates. In fact, they themselves did not know until the plans were subsequently worked out what they would require.

Other sources of information.—The same difficulties which made it impossible to secure options made it equally impossible for the builders to estimate the cost from an examination of current prices. In the first place there were practically no current prices for materials of the quality required; in the second place, prices of forgings, for example, naturally vary considerably, according to the size of the forging and its simplicity or difficulty of design; finally, without complete plans and without experience in constructing boats of this class it was impossible for the builders to estimate the amount of the various materials which they would require.

We have already seen that no reliable estimate could be based upon the cost of previous torpedo boats. It is even more evident that battle ships, cruisers and gun-boats, or steel merchant vessels, yachts and launches, would not furnish a safe standard for comparison. It is not too much to say that the principal elements affecting the cost of torpedo boats and destroyers are the particulars in which they differ from boats of every other type. The experience which these builders had had with other vessels was therefore only of the most general assistance to them in making their bids. As illustrating the entirely disproportionate cost of torpedo boats and destroyers

reference may be made to the testimony of Mr. Hyde, vice-president of the Bath Iron Works, before the Senate committee. Mr. Hyde stated that the cost of gun-boats and similar vessels which his firm had successfully built ranged in the neighborhood of \$300 a ton. The average contract price per ton of the torpedo boats and destroyers now in question was, respectively, \$904.38 and \$673.33, and these amounts proved to be wholly inadequate.

Complete plans not of great assistance.—The Bath Iron Works were perhaps in the best position to estimate successfully the probable cost of the boats. They had purchased from M. Normand complete plans for the *Dahlgren* and *Craven*, which they proposed to follow as nearly as possible in the new boats for which they were bidding.

Though the new boats were of larger size and of higher requirements as to general equipment and fittings, and particularly as to seagoing qualities, and though the working out of the designs was subject to the supervision of the government inspectors, the possession of the complete plans for the *Dahlgren* and *Craven* doubtless gave the Bath Iron Works a certain advantage over the other bidders in estimating the amount and character of the work involved. But this advantage did not assist them very greatly in preparing their bids. They were unable to obtain options upon their materials, and they found that the possession of these plans by no means made up for their want of experience. The statement of Mr. Hyde, vice-president of the company, to the Senate committee on this point is as follows:

“Even given the plans of a boat of that character in absolute detail, unless one has had experience as to cost per pound, cost per ton, cost of the different parts of the work before him, of completed vessels, and knows the data to be absolutely correct, all of the factors you use in making up your estimate, even giving weights, are matters of personal judgment.”

Moreover, as Mr. Hyde also pointed out, the cost of the labor required is at least as important an element as that of the material, and in boats of such small size is ordinarily greater. Only by experience could it be learned how much labor and of how expensive a character would be required to carry out the plans and accomplish the results required.

Summary.—It thus appears that the most important causes of the inability of the builders correctly to estimate the cost were, first, their inexperience with this type of boat; second, the fact that the materials required were of a character entirely new, and the designs equally so; third, the fact that the working out of the plans and specifications was subject to the direction of the government inspectors, whose requirements might vary through a rather wide margin; and fourth, the fact that only sixty days was allowed them to work out the problem. Had they been allowed time to complete their detailed plans, to gather all possible information from a comparison of foreign prices and the designs of foreign boats, to examine into the cost of producing the kind of material required, to compare the completed designs of these boats with boats previously built in this country, and in general to collect such data as were available they would doubtless have been better able to approximate the probable cost of the boats. There would still have remained many elements of uncertainty. Nothing, in fact, could take the place of experience in building boats of this class. The problem was too complicated, the material, the designs, the labor and skill required of too special a character to allow of reliable comparison based on anything except previous experience with boats substantially similar. But even had this not been so it was obviously impossible for the contractors to gather anything like complete data or prepare anything like detailed estimates from the information available within the sixty days allowed them.

Actual basis of the bids.—Since the contractors were thus entirely at sea, the question at once arises on what basis their bids were made. This question is very clearly answered in the evidence given before the committees. In a word, the bids were based principally upon the Navy Department's estimates of cost.

The contractors knew that the Government had not determined upon the building of so many torpedo boats and destroyers without careful study of the subject by the Navy Department. They justly assumed that the amount of the appropriation allowed by Congress for the construction of these boats was based upon estimates prepared by the Navy Department, which presumably corresponded very closely to the upset prices fixed by the department in the advertisement for bids. The department had not made its estimates without a much more extended investigation than it was possible for the builders to make in the sixty days allowed them. The builders had had no such occasion to investigate the question of torpedo-boat construction. They had every reason to believe that the department knew more about the subject than they did.

Moreover, it had been their experience in the past in the construction of other naval vessels that the department's estimates of cost were reliable and that the upset price

fixed by the department usually allowed a margin for profit. They found, therefore, in the department's estimates, as represented by the upset prices, what they naturally regarded as the most definite and reliable information available within the short time allowed them as to the probable cost of the boats.

For reasons which have already been stated at length, the builders found it impossible even to attempt the preparation of detailed estimates. They made such general estimates as they could from comparison, for example, with the cost per ton of vessels of other types, or from the total weight of material contemplated, and the cost per ton or per pound of the materials and labor for corresponding parts of other vessels. They then compared these estimates with the upset prices. Such estimates taken alone were necessarily too indefinite to be reliable, but they served to confirm the confidence of the builders in the department's estimates. Thus, for example, they found that the upset prices for torpedo boats allowed for a cost per ton over three times as great as that of a gunboat. There was obviously nothing in such a comparison to lead inexperienced builders to question the accuracy of the department's estimates upon which the upset prices were based.

It is not strange, therefore, that in the end the bids were based almost entirely upon the upset prices. In this the builders were directly encouraged by the department officials. The advertisement for bids was published before all the plans and specifications which were to be furnished in advance of the bids had been completed by the Government. Accordingly, several of the prospective bidders, if not all, sent representatives to Washington to examine, at the department offices, such of the plans and specifications as were ready. As is customary in such cases, these representatives also consulted other data in the department records bearing upon the question of torpedo-boat construction and discussed the probable cost of the various parts with the officials of the different bureaus. The department officials believed that the upset prices were ample for the construction of boats at a good profit, and they did not hesitate to express this opinion.

The experience which both department and builders have since acquired has shown to both how imperfect was their knowledge of the difficulties which the problem before them involved. But when the work was undertaken the department had at least more data than the builders; had had a much longer time in which to consider the question, and the department officials undoubtedly believed their estimates to be fairly accurate. The builders had no other available source of information which so well merited their confidence. They accepted the judgment of the department and based their bids on the upset prices.

Comparison of bids with maximum prices allowed.—Remembering that these prices were intended to allow a margin for profit, and that, in the case of previous boats of other types, this margin had always proved to be ample, each contractor realized, of course, that in order to obtain contracts he must make his bids somewhat less than the maximum allowed. Even then, appreciating to some extent the difficulty of the work they were undertaking, they bid, as one witness expressed it, as high as they dared. In the case of the torpedo boats, the upset price and the contemplated displacement gave a price per ton of about \$1,030. Four of the six successful bidders bid at the rate of over \$900 per ton. The Bath Iron Works and the Columbian Iron Works, who, as we have seen, had slightly more information to go on than the rest, bid at the rate of over \$1,000 a ton. The next two bids were \$970 and \$966 per ton. In the case of the destroyers the upset price and the contemplated displacement allowed a cost per ton of \$702.37. All the successful bids except one were at the rate of at least \$660 per ton, which is practically 95 per cent of the department's allowance.

By far the lowest of the bids for both boats and destroyers were those of the William R. Trigg Company, which built two of the destroyers and three of the boats. That company had never been in business before these contracts were placed. It was formed for the purpose of building some of these boats. Its members and staff, though experienced in various kinds of steel construction, and though one of them had successfully designed the engines of the battle ship *Texas*, the first modern battle ship built in this country, had never before built vessels of any class. They naturally relied, to an even greater extent than their competitors, on the sanguine opinions of the department officials. Moreover, they realized that their comparative inexperience in naval work would count against them in the award of contracts, and that they could obtain contracts only by very low bids.

The fact that so many of the bidders ventured to bid so high is explained by the increased speed which the majority of them offered. As we have seen, the department's circular announced that guarantees of speed above the required limit would be given weight in awarding contracts, and seven of the eleven bidders took this method to secure the acceptance of their bids, guaranteeing from half a knot to two knots above the minimum requirements. Here, also, as we shall see hereafter, they were misled

by their inexperience and their reliance upon the superior knowledge of the department. The point of present importance, and one which should not be forgotten, is that only about one-eighth of the total loss would have been saved had all the bids been up to the maximum allowed by the department.

Conclusion.—To sum up, it must now sufficiently appear that the inadequacy of the bids resulted directly from the inexperience of American builders with boats of this type, and their reliance upon the judgment of the Navy Department as to cost. It must also appear that such reliance was not only natural, but almost inevitable. It appears further that so far as the heavy loss which the builders suffered is attributable to the inadequacy of their bids, only about one-eighth of it could have been avoided except by refusing to bid at all. They could hardly be expected, in view of their inexperience, the novelty of the problem, the difficulty of securing reliable data, and the short time allowed them for preparing their estimates, to discover what the Navy Department itself did not then imagine, that the appropriation of Congress was altogether insufficient to cover the cost of the boats proposed.

That the estimates of the department were, in fact, inaccurate, is not difficult to understand in the light of subsequent experience. We have already seen that the department had very little advantage over the builders in the matter of experience, which is the only safe guide. The few torpedo boats then completed had not been built in the government yards, and they were, moreover, of a much less difficult and expensive type. The advantage which the department had over the builders was chiefly in the much more extended study which the department officials had been able to give the problem than was possible to the builders in the brief time allowed them. The department had a further advantage in the fact that, while the details of the plans and specifications had not yet been worked out, and the general requirements left a considerable margin for subsequent determination, it was the department officials, and not the builders, who were ultimately to determine the detailed requirements. These advantages, while they were sufficient to justify the builders in accepting the department's estimates as more likely to be reliable than any which the builders themselves could have made up from any information available to them in the time allowed, were not sufficient to provide against all the uncertainties which the problem involved.

This brings us to a consideration of the circumstances which operated to increase the cost beyond all expectation.

E. CAUSES OF THE EXTRAORDINARY COST.

1. COST OF MATERIALS.

Reference has already been made to the unusually high quality of the materials which the department specifications required for these boats. This was true of the plates, the forgings, and the castings. Such high requirements naturally involved a higher cost of material, and this of course was evident in advance; but the prices actually paid for material were altogether beyond what could possibly have been anticipated.

General rise in prices.—In the first place, there began almost immediately after the contracts were placed, and continued during the period of construction, a general rise in prices of commodities, due to prosperous times. This undoubtedly affected to a certain extent all the material which went into the boats; but only a very small part of the excessive cost of the special materials required can be charged to this general increase in prices.

Extraordinary prices of forgings.—This is particularly noticeable in connection with the forgings making up the greater part of the machinery. For these the builders had to pay at the rate of from \$1 to \$3 per pound. The average price must have been at least \$1.50 per pound. These prices were far in excess of anything which either the department officials or the builders had imagined. Similar forgings for ordinary commercial work cost at the time of the committee hearings, early in 1904, about 5½ cents a pound, and this it will be remembered was after the general increase in prices referred to. Such merchant forgings are not of course of nickel steel nor are the requirements in any way comparable with the rigid requirements of the Government for these boats. In merchant practice, it is usual to specify only good soft steel. The government requirements, in addition to specifying nickel steel in the matter of the tensile strength of the material, went to the very highest limit which modern steel making is able to produce. But such an extraordinary difference in cost could not possibly have been anticipated.

The builders found only two steel makers in the country who could make such forgings. These were the Bethlehem Steel Company and the Midvale Steel Company. At least one other company attempted to make them, but without success. As the

work progressed the Bethlehem and Midvale companies, which were absolutely overwhelmed with orders for forgings for these boats, and ran their forges night and day for three years in order to make them, continually increased their prices. It will be remembered that in most cases prices could not be obtained until the drawings were completed, and it was therefore impossible to place contracts for all the forgings at the beginning.

The prices charged were not only out of all proportion to the prices for ordinary merchant forgings, but they were over twice as high as the prices for the same kind of nickel steel forgings abroad, even with freight and duty added. The Bath Iron Works obtained, for the sake of comparison, a figure from the Krupp works in Germany, which quoted 62 cents a pound delivered in New York, duty paid. As stated above, the builders were not permitted to purchase abroad, and the Bath Iron Company paid for its forgings purchased in this country an average of over twice as much.

Finally, corresponding forgings of nickel steel for naval vessels of other types could be obtained in 1904 at from 25 to 75 cents a pound. Such forgings are larger and less difficult and expensive to manufacture than the torpedo boat forgings. But even when thus partially explained, such a difference in price indicates how abnormal was the cost of the forgings for the torpedo boats and destroyers.

There was apparently some difference of opinion between the builders who testified before the committees as to the extent to which these prices were justified. Some of them expressed the opinion that the prices were artificially raised by combination; that the two steel concerns, realizing that they had the builders at their mercy, took advantage of the builders' necessities, and charged prices which were excessive. On the other hand several of the builders were inclined to think that the steel makers charged no more than was necessary to make them whole.

Conditions justifying high prices.—There are many reasons to believe that the cost of these forgings to the makers must have been very high. In the first place nickel steel is an expensive material to manufacture, and a very difficult material to work. It requires in many cases special tools, and these tools wear out much more rapidly than in the case of carbon steel. The work practically requires a special plant and special skill. There were several steel concerns in 1893 making nickel steel for armor, but of these the Bethlehem Company was the only one which had a forge. Other forging companies had no facilities for making nickel steel. To enter upon this work would, therefore, have required of them a large outlay of capital. The Midvale Company chose to make this outlay, but other steel concerns did not follow their example. There was almost no demand for such forgings outside of the government work, and the total amount of this work in proportion to the entire amount of business done in steel forgings was too small to tempt many manufacturers to equip the necessary plant.

Again the Government requirements were so high and their tests so rigid as to make the business an exceedingly risky one. A great many forgings were rejected by the Government's inspectors, and all the labor spent upon them was then lost to the steel makers, and the rejected material had no value except as scrap steel, at about half a cent a pound. Not infrequently as many as ten forgings had to be made before one was secured which would satisfy the government tests. The cost of the small forgings was greatly increased by the fact that there had to be attached to each a piece which could be used by the government inspectors for testing purposes. This piece must be a part of the forgings when made, in order to make the test of any value. It was then broken off and pulled to pieces in the government tests, and the fragments thrown away. In the case of the small forgings this additional material for the purposes of the test would sometimes be very nearly as large as the forging itself.

Moreover, the peculiarities of the designs often involved the waste of a very large portion of the material. Thus the crank shaft of one of the torpedo boats was a solid nickel-steel forging, which, when it went into the lathe, weighed 14,000 pounds. It required three months to work it into the desired shape, and when completed it weighed 1,300 pounds. The builders paid only for this 1,300 pounds, but in the making of it over ten times as much nickel steel had been used up. If after all of this material had been used and several months of labor had been spent, the forgings failed to satisfy the test, as sometimes happened, it is evident that the loss to the maker was not trifling. A succession of such experiences would easily explain how the steel makers might have found it necessary continually to raise their prices as their experience with this work progressed.

A typical illustration.—But whether or not the prices were justified by the cost, the builders had no choice but to pay them. The following experience is typical:

The Columbian Iron Works obtained bids from the Bethlehem and Midvale companies and also from the White Stone Forging and Iron Company, of New York. The latter bid was the lowest and the contract was given to that company. It subsequently appeared that the White Stone Company would be unable to furnish the forgings. The Columbian Iron Works then applied to the Bethlehem Company,

which declined to take any orders, and the forgings were finally obtained from the Midvale Company, at \$2.30 a pound.

Similar conditions as to castings.—The conditions in connection with the remainder of the materials were very similar to those which prevailed in the matter of the forgings. Thus the castings, both bronze and steel, were of very difficult construction. Only a few firms would take orders for them, and those charged exceedingly high prices.

For example, when the contracts were made steel castings were selling at 12½ cents a pound. The general manager of the Maryland Steel Company testified that by the time he succeeded in getting his drawings into the hands of the people who made the castings the price had advanced to 20 cents a pound, and that price was paid.

Again, the high-pressure and intermediate pressure-cylinders for the torpedo boats were one solid casting, of exceedingly difficult design. Several of the most experienced foundries refused to have anything to do with a casting of that design. In the original construction of the engines for their boats the George Lawley & Son Corporation broke three such cylinders. On the trial trip of one of the boats one of these cylinders broke, and it took the company over two years to replace it. At the time of the committee hearings they were working on the eighth casting for this cylinder. Meanwhile they had in the previous year built five or six triple expansion engines for high-class commercial work without losing a cylinder.

The cost of the bronze castings required also increased during the progress of the work, but that increase was due largely to the rise in the price of copper, which took place shortly after the contracts were placed.

Extraordinary prices of plates.—The plates for the hulls, like the forgings, required a very special quality of steel, possessing an unusual degree of ductility and tensile strength in order to make them sufficiently strong and at the same time as light as possible. Most of the builders found only one steel concern in the country which would attempt to make such plates. This concern, the Allan Wood Company, made nearly all the plates for the 28 boats. The difficulty of the work, requiring the very highest skill, the severity of the inspection, the many failures and rejections, the overwhelming number of orders, made the conditions almost identical with those which affected the price of the forgings. Under these circumstances high prices were naturally charged, and were entirely justified by the cost of the product.

The Maryland Steel Company obtained options on this part of their material either before making their bids or just afterwards, at substantially the prices prevailing before, and these options were carried out, but the prices at which the options were given were enormous prices.

A certain amount of the extraordinary cost of material was undoubtedly due to the refusal of the steel makers to perform options which they had given; but, as we have seen, the builders were able to obtain options on only a small proportion of their materials, and some of these options were performed; so that the increased cost chargeable to the refusal of the steel makers to deliver at the prices agreed upon was comparatively small. In the great majority of cases no prices were quoted until the drawings were made, and the only prices named were the extraordinary prices which the builders had to pay.

Helpless position of builders.—Moreover, even such loss as did result from breach of contract on the part of the material men as a practical matter the builders had to stand. The steel makers claimed that they were doing the best they could, and that they could not afford to carry out their contracts. There was at least considerable basis for such claims, and since the shipbuilders were at the mercy of one or two concerns if they were to get their material at all, it was out of the question for them to stand upon their legal rights. Any builder who had attempted to do so, even if he had succeeded in recovering in his suit, would have found that his last state was worse than his first.

Summary.—To sum up this situation, the steel makers of the country were no better prepared for work involving such materials and designs than were the shipbuilders. They had a very similar problem to deal with. Only a very few of them were willing to undertake it at all. But these were in a position which enabled them to throw upon the shipbuilders the burden of all the difficulties and expense which the solution of this problem involved.

2. COST OF LABOR.

General rise in wages.—The labor cost was increased by causes corresponding very closely to those which affected the cost of material. In the first place there was, during the period of construction, a general rise in the price of labor, due to pros-

perous conditions and an abundance of demand. Some of the builders suffered also from labor agitations and more or less demoralization of labor, such as are likely to occur when times are prosperous and the demand is large.

Scarcity of properly skilled workmen.—Another cause of the high cost of labor, however, was necessarily involved in the nature of the work. This work, both because of its intricacy and difficulty, and because of the character of the materials to be worked, required the highest class of skilled labor. Moreover, the amount of labor involved was much larger than anyone had anticipated. At the same time, the placing of all these contracts, together with a large number of other naval contracts, at a time when all branches of industry were crowded with work, created an extraordinary demand for labor of the class required, and resulted both in a scarcity of properly skilled workmen and in a consequent increase of wages beyond that for which the general rise in wages was responsible.

Delays.—The labor cost was also greatly increased by the many delays in the progress of the work, resulting from several causes which are now about to be considered.

It will be remembered that the contract time for the completion of the torpedo boats was only twelve months, and that allowed for the destroyers eighteen months. This allowance would have been small enough under the most favorable circumstances. One of the builders testified that before the work was begun he did not see how it could possibly be completed in that time, but that he also did not see what he could do about it. He doubtless anticipated that if it proved actually impossible to build the boats within the time set the department would permit an extension of time without penalty, just as was in fact done; but neither the builders nor the department imagined that any such delays would take place as did result. The average extension of time granted in the case of the torpedo boats was nineteen and one-half months, and in the case of destroyers thirty months. Such extensions were not allowed without careful investigations, satisfying the department that, at least so far as the builders were concerned, the delays were unavoidable. We have now to examine the causes of these delays.

3. DELAYS IN OBTAINING MATERIAL.

Conditions prevailing.—In the first place, it proved to be utterly impossible to obtain the necessary materials within the time allowed for the construction of the boats. The reasons for this situation are apparent from what has already been said. Only two concerns in the country were able to furnish the forgings required. Only one steel maker was willing to take orders for any considerable number of the plates. Very few foundries would undertake to make certain of the most important castings. These few concerns were taxed to their utmost capacity for several years to turn out the work required for these boats and for a large number of other naval vessels building about the same time.

It is very likely true, as suggested by one witness before the committees, that the steel men might have produced this material more rapidly had they devoted a larger part of their plants to the work, and that they gave a preference to other interests showing more tonnage. It is equally true that the work could have been done faster had a larger number of steel makers gone into the business of furnishing these materials. But neither of these assertions materially affects the situation. The fact remains that the existing plants which their owners chose to devote to this work were taxed to their capacity and ran night and day to fill their orders. A few of the results will serve as examples.

Individual experiences.—Reference has already been made to the experience of the George Lawley & Son Corporation with a cylinder. They were delayed over three years after one of their vessels had reached the trial stage in the effort to replace a single important and difficult casting. This same company placed its orders in every case regardless of cost on promise of prompt delivery. Without exception the delivery of the material was delayed beyond the promised time, and in some cases over a year. Mr. Lawley ordered his forgings from the Bethlehem Company by telegraph in advance of any other contractor. The crank shafts were not delivered for twelve months. As soon as sufficient material arrived, the company ran its machine shop night and day for over a year and a half in order to make up for lost time.

The Bath Iron Works received the last keel plates for its vessels, which are, of course, the first things wanted, eight months after the contract time for the completion of the boats had expired.

The Midvale Company promised to deliver the forgings ordered by the Columbian Iron Company in eight months. One of the crank shafts necessary to install the

engines in the boat was not delivered until December, 1902, four years after it was contracted for.

These examples will suffice to show the difficulty which the builders had in obtaining any materials to work with. It may be added that such examples are typical, though perhaps among the most striking, and that practically all of the material for all the boats was delayed in delivery from several months to two or three years.

These delays can in no sense be charged against the builders. Being fully aware of the short time which their contracts allowed them, they made every effort to place their orders as soon as the approval of their detailed drawings would permit them to do so, and they exerted all the pressure they could upon the material men to hasten the delivery. This matter was thoroughly investigated by the department when the extensions of time were granted.

Effect of such delays.—It is hardly necessary to say that such delays involved an immense increase of cost. Large forces of skilled laborers had to be employed for this work, and while they were not, of course, kept on the pay rolls idle for long periods, it is evident that no large piece of work can be done with the same economy of labor when its prosecution is delayed for months at a time. The largest increase of cost resulting from delay, however, was probably in the item of indirect expense. It must be apparent that when a piece of construction lies in the yard and excludes other possible work for two or three times as long as would be required for its completion were it not delayed the indirect expense which must be charged against that piece of work in order fairly to represent its total cost is immensely increased.

The question of breach of contract.—In some cases the delay in the delivery of material involved a breach of contract on the part of the material men, and theoretically suit might have been brought against them to recover the damage resulting; but it is true here, as in the matter of prices, that as a practical question the builders were obliged to stand the loss. If they had not submitted to these delays with the best grace they could they would have been fortunate ever to get their material at all. The steel men protested that they were doing their best. As one of the witnesses before the committee expressed it, it would have been a sad day for the contractor who had sued the material men for such delays. Being limited as they were to a few large concerns, the builders were helpless.

Moreover, it was only in a small proportion of the cases that the delay involved any breach of contract. Most of the builders testified that while the steel men were willing to promise informally that they would deliver within a certain time, or to make a statement to that effect, they refused to make it a part of the contract. They were in a position practically to dictate their own terms. They were crowded with business. Naturally they realized the advantage of their position and refused to bind themselves to any definite time. They had their own difficulties, as already shown, in meeting the rigid inspection of the Government, and these difficulties largely account for their inability to keep their informal promises; but here, as in the matter of the cost of the material, whether the delays were due to any fault of the steel makers or whether they were unavoidable results of the difficulty of the work, and the amount of it required, the material men were in a position to throw the burden of the loss on the shipbuilders.

Summary.—It will be seen from the foregoing discussion that a considerable portion of the extraordinary cost of materials and the extraordinary delay in obtaining them was necessarily involved in the extraordinary quality of the materials required, the difficulty of their manufacture, and the fact that the steel industries of the country were almost totally unprepared to handle such a quantity of new and difficult work. In a word, neither the builders nor the department had any idea that it would cost so much to make these materials or that it would take so long to obtain them. Nor, under the circumstances, can it be said that they ought to have anticipated these conditions.

If the Government itself had undertaken to build these boats it would have found itself equally unable to avoid these delays; and it is unquestionable that if the boats had been built in navy-yards they would have cost more than they cost the contractors, and would have taken longer to complete.

Again, a certain amount of the cost of material, especially during the latter part of the period of construction when the prices were highest, may perhaps be ascribed to an artificial raising of prices due to the virtual absence of all competition for the work.

Still another cause which affected both the prices of material and the delay in delivery, namely, the severity of the government inspection, has already been suggested and must now be more fully considered in connection with the general subject of department supervision.

4. BURDENSOME INSPECTION AND SUPERVISION.

Change in department policy.—The conditions as to government supervision under which the boats were built have a very important bearing upon the extraordinary cost. The construction of these boats marked a decided change of policy on the part of the department in the matter of inspection and supervision.

It had always been customary in the building of naval vessels to require that the plans be approved by the department and that the work be done under government inspection. But the power thus reserved to the department may evidently be exercised with either a light or a heavy hand. In the building of previous torpedo boats the builders had been hampered but little by the government inspectors. They had been made responsible for the results and had been given comparatively a free hand in their efforts to secure them. This is, of course, the way in which practically all private contracts are performed. In the case of the new boats, however, the department's right of supervision was exercised to an unprecedented degree. This does not mean merely that the Government insisted on the observance of the specifications and requirements of which the builders were informed when their contracts were undertaken. Within the language of the specifications a considerable discretion was left to the government inspectors. This discretion was exercised in almost every case in favor of the most extreme requirements.

Addition of new requirements.—It has already been stated that during the progress of the work the department was constantly profiting by the experience of earlier boats, and imposing, within the general language of the specifications, additional requirements in details of equipment, convenience, comfort, and habitability. These additional requirements were undoubtedly in most cases desirable ones, tending to increase the value of the boats; but they went beyond anything which had previously been required either in this country or abroad, and the boats would have been excellent and efficient boats had the requirements been lighter in a multitude of these details. Such additional requirements not only directly increased the cost, but by the added weight which they frequently involved they continually increased the difficulty of the principal problems of construction.

A few of the changes and additions ordered by the inspectors were so far outside the original specifications as to be classed as extras, and for these an allowance was made. But the language of the contracts was such as to make these cases comparatively few, and the total allowances were very small.

Inspection of materials.—Again, in respect to the quality of the materials, the specifications left the inspectors more or less discretion as to the severity of their tests. In the exercise of this discretion the inspectors pushed their requirements to the very highest limits which the utmost skill of the steel makers was able to attain. This, again, was undoubtedly in the interest of the highest excellence in construction, but it imposed on the steel makers an additional burden, which their position enabled them to shift onto the shoulders of the contractors. This does not mean that either the steel makers or the contractors desired to use poor or defective material. None but material of an exceedingly high quality would have satisfied the requirements originally defined in the specifications—a higher quality, in fact, than had ever before been employed in naval construction—and the inspectors might appreciably have relaxed the severity of their tests without any possibility that the quality of the material could be justly criticised. The department was not limited, however, by the previously defined requirements, and it was its policy to consider nothing good enough if better could possibly be made.

No criticism is here intended either upon the inspectors personally for their extremely conscientious performance of the duties assigned them nor upon the wisdom of requiring the highest possible excellence; but where the initial requirements of the specifications were so extremely high, it will be readily understood that even a slight addition to these requirements involved an utterly disproportionate increase in the number of failures and rejections, and therefore an utterly disproportionate increase of cost. The point here material is that such extreme severity had never before characterized the department supervision and that the builders had no adequate warning of the increase of cost which necessarily resulted, nor did the department's own estimates make adequate allowance for it.

Inspection of detailed plans.—The same extremely rigid supervision characterized the department's inspection of the builders' detailed plans. It will be remembered that all these plans, amounting in each case to somewhere about a thousand drawings, had to be prepared by the builders as the work progressed and submitted to the government inspectors for approval. The fifth clause of the contract was as follows:

"The party of the first part will, at its own expense, prepare such plans or drawings as may be necessary during the progress of the work, and will submit the same

to the Navy Department for approval before the material is ordered or the work commenced."

As we have seen, both the builders and the department were working out a new problem involving a multitude of difficulties of design which could not be individually foreseen before they were encountered. For the solution of each of these difficulties the builders had their own ideas and the department inspectors frequently had theirs. The builders were repeatedly delayed in securing approval of their plans. Consultations with the bureaus were often necessary, and, having a great many plans to pass upon for these and other naval vessels, the bureaus were sometimes very slow in getting the work through their hands.

In some cases, at least, of which examples will presently be cited, the judgment of the builders proved to be better than that of the department. In other cases undoubtedly the changes which the department demanded increased the excellence of the boats. But it must be evident that the policy of rigid supervision adopted not only considerably delayed the progress of the work, but hampered the contractors greatly in other ways. Here, again, it is not that the builders desired to furnish inferior designs. They were as anxious as the inspectors successfully to solve all the difficulties involved; but both the builders and the department were experimenting with problems that neither of them had yet solved. Had the department either undertaken to prepare the designs itself or, on the other hand, left the builders to follow their own judgment, the final results might not have been, on the whole, so excellent as they actually were, but it is clear that the delay and expense would have been much less. Any manufacturer would agree that if certain results are demanded of him, and he is given a free hand in the production of those results, or if, on the other hand, he is furnished with complete designs and specifications which he has only to follow, leaving the responsibility for the results on the makers of the plans and specifications, he can perform the work with much less difficulty and expense than if, while he is made responsible for the results, he is continually hampered in working out his problem by having to secure the approval of some one else for every step taken. A few illustrations from the multitude of vexatious incidents will serve to make the point clearer.

Individual examples.—The Bath Iron Works submitted as a part of their plans the designs of the boilers for their boats. These designs were at first rejected by the Bureau of Steam Engineering, but after four or five months' delay the company succeeded in securing permission to follow them. The result vindicated the judgment of the company, as the torpedo boats built by the Bath Iron Works made a higher speed than any of the others, and were pronounced by department experts the most successful and satisfactory of all the torpedo boats. But the delay in obtaining the approval of the department resulted in a considerable increase of cost. Owing to the particularly small space required for boilers of the type in question, the entire design of the boats was held back. When the orders for material could at last be given the mills were crowded with prior orders and still further delays resulted.

These boilers which were used by the Bath Iron Works, and which proved so successful, were Normand boilers. The Maryland Steel Company had also contemplated the use of Normand boilers, but conditions imposed by the Bureau of Steam Engineering compelled them to use Thorneycroft boilers instead. Not only were the Normand boilers, in their opinion, more desirable and more likely to enable them to attain their speed, but they could have been used without royalties, whereas the company had to pay for the Thorneycroft boilers about \$5,000 per boat in royalties.

The George Lawley & Son Corporation received one of its crank shafts three months late. The government inspector found what he regarded as a flaw in it and condemned it. Mr. Lawley complained to the Bethlehem company, which made the forging, and they sent on an expert to examine the shaft. This expert demanded a government board to pass upon the matter, and such a board was established and sent to the yard. They inspected the shaft, put it under hydraulic tests, determined that it was satisfactory, and passed it. Meanwhile the builder had been subjected to just so much additional delay and consequent expense.

Question of reliance on inspectors.—In connection with this matter of department supervision there is a statement in the report of Naval Constructor Linnard and Lieutenant Chandler to the Bureau of Construction and Repair which deserves a brief consideration. It will be remembered that those two officers had been directed to inspect the torpedo boats and destroyers under construction on the Atlantic coast in November, 1901. Their report, which is published on page 44 of Senate Document 112, contains the following passage:

"Furthermore, some of the contractors maintained that they were not at liberty to carry out their own designs and ideas; that they were hampered by the inspectors; that had they been free to do as they pleased they would have achieved the results

called for. It is difficult to state how much truth there is in this latter contention, but it is obvious that in many cases the contractors relied upon the inspecting officers to furnish information for the working out of the details of these vessels."

It is not intended to repeat at this point the claim which thus appears to have been informally made by some of the contractors during the progress of their work, that had the builders not been hampered by the inspectors the boats would have attained their original contract speed, though it will presently appear that there is much to justify such a contention. A word should be said, however, as to the suggestion that the contractors had relied upon the inspecting officers for information in working out their plans. To a certain extent this was probably true, but the statement involves nothing to the discredit of the contractors, nor does it contradict anything which has been said above. Since in nearly every case the outline plans were either principally or wholly the department's, and since the calculations as to weights and displacement, the specifications as to quality of material and the general miscellaneous requirements were also the department's, and since, moreover, every detail of the designs was rigidly scrutinized by the department officials and must receive their approval, the least which could be asked of the inspectors was that they should give the builders the benefit in advance of the ideas which they did not hesitate to insist upon when the drawings were submitted. Had the builders been left free to work out the details according to their own judgment, they would cheerfully have accepted the responsibility for the success of the designs.

It is but just to the builders to say that, in spite of the burdensome requirements of the inspectors, they conscientiously stood by the obligations of their unequal contracts and made every effort to perform the most exacting demands made upon them.

Importance of this cause of loss.—In the greatly increased severity of the Government's supervision and inspection is to be found one of the principal differences between the construction of these boats and of the earlier torpedo boats. In addition to the difficulties and delays resulting from difference of opinion between the builders and the department as to the best method of securing certain results, it must be remembered that the department had no such motive as the builders for keeping down the cost. While this circumstance, on the one hand, furnishes the principal justification for such rigid inspection, it suggests, on the other hand, how such supervision, when all the requirements of the contracts are not determined in advance, may operate to increase the cost indefinitely.

The defined requirements of the specifications were sufficiently high to make the problem of fulfilling them exceedingly difficult and expensive. In performing them, had no further requirements been added, the builders would have been entirely justified in cutting down the cost in every particular where the requirements of their contract permitted. This is the manner in which private contracts are performed, and the only manner in which they can be successfully performed. But when these original requirements, which in themselves marked a considerable advance over any results previously attained, were constantly increased by the imperative directions of the department, demanding in almost every particular left to its discretion a further improvement over previous construction, without regard to the cost involved, the hopes of the builders for a successful issue of their undertaking received a final blow. No manufacturer would for a moment consent to do work for any employer except the Government under similar conditions.

5. EXCESSIVE DISPLACEMENT AND ACCOMPANYING DIFFICULTIES.

There remains one other important cause, more or less closely related to those already considered, which operated in more ways than one to increase the cost of the boats. This was the difficulty which nearly all the builders experienced in attaining the required speed, and the necessity of increasing considerably the contemplated displacement.

The relation of speed and displacement.—The nature and principal elements of the speed problem have already been discussed. Given the general dimensions and the outline plans of the boat, the two important elements affecting speed are, of course, weight and power. If the weight of hull and engines is cut down below a certain limit the construction can not be sufficiently strong to withstand the vibration resulting from the extremely high power of the engines. On the other hand, the weight must be as small as is consistent with sufficient rigidity or it will require too much power to drive it. If the power is increased the difficulty of vibration is correspondingly increased, and still more weight must be added to both engines and hull. In a word, the elements must be balanced with the utmost nicety.

Calculations as to displacement, horsepower, and speed were based in the case of these boats wholly on the known performances of other similar boats. A given increase

in displacement has in practice resulted in a certain diminution of speed. A given increase in power has resulted in a certain increase of speed. From such data it is possible to estimate approximately the amount of power which will be necessary to drive a boat of a larger or smaller displacement at a given speed. Such data had been gathered by the Navy Department and were there on file, and such calculations were undoubtedly relied upon by the department in estimating the contemplated speed, displacement, and power of the boats in question.

It will be remembered that the department, in fixing the requirements for these boats, adopted a somewhat lower minimum speed than in the case of the previous boats then building, in order to favor greater strength of construction. But it will also be remembered that the contract requirements as to such matters as equipment, carrying capacity, fittings, etc., were such as to involve a considerable increase of weight over the corresponding parts of previous boats, without in any way contributing to the strength of the hull; so that in the end greater power was required in the engines without permitting any corresponding increase in their weight. It was attempted to compensate for this increased weight of many other parts of the boat by providing for the use in both hull and machinery of a much higher quality of material than had been previously used, thus effecting a saving in weight. The marked differences between these boats and any previously constructed, the comparative inexperience of the Navy Department; and the uncertain possibilities of the new materials, all rendered the calculations as to speed and weight uncertain, and it is not surprising that some errors resulted.

Contract requirements as to displacement.—The act of authorization called for destroyers of about 400 tons displacement and torpedo boats of about 150 tons, and the advertisement for bids followed this language. The circular issued by the department stipulated, however, that no bids for boats of less than these weights would be considered, and no bids for destroyers of more than 435 tons or torpedo boats of more than 170 tons. The Government's designs for destroyers contemplated a displacement of 420 tons and for torpedo boats a displacement of 165 tons. The boats for which contracts were awarded on the bidders' plans differed in contract displacement only a few tons from the contemplated displacement of the government designs; and, as we have seen, these bidders' plans, except in the case of the Bath Iron Works, were in general only partial modifications of the government plans.

Necessity for additional weight.—As the work progressed the contractors found that the problem of combining sufficient power with sufficient rigidity presented difficulties which could not have been foreseen until the details of the plans were worked out, and in many cases not until the preliminary trials. When the preliminary trials began there developed in nearly all cases an excessive vibration. The power which the boilers were fitted to develop was ample, but when this maximum power was developed the strain on engines and hull was tremendous, and the designed displacement, in view of the increased requirements in other particulars, did not allow a construction heavy enough to stand such a strain. The vibration in some cases was so great that it threatened to shake to pieces not only the engines but the hulls themselves. To overcome this difficulty required many changes, and in particular much bracing and strengthening, all of which tended to increase the weight. While the vibration was thus cured the load was increased, and thus one difficulty substituted for another in the matter of attaining speed.

In many cases the necessity for additional weight appeared in the course of the construction, even before the trials. In some instances it was foreseen by the builders; in many others the heavier construction, and the more elaborate and therefore heavier equipment and fittings, resulting from experience on other boats, were ordered by the government inspectors.

Losses resulting.—The final result was an increase of weight over the designed displacement which averaged $11\frac{1}{2}$ per cent for the destroyers and about $16\frac{1}{2}$ per cent for the torpedo boats. In other words, the proper balance between weight and power had not been accurately estimated in advance; and in fact it could be learned only by experience.

The experience, however, was costly. In the first place all this additional material had to be paid for, and after what has been said of the prices of material it is evident that this meant a very large increase of cost. Again, while these lessons were being learned many changes of design were necessary, and much of the work had to be done twice. The expense of the unsuccessful trials was another large item. This expense includes both the cost of the oil, fuel, etc., required, and the wages of the crews. Such boats have to be handled with the utmost efficiency in order to get the greatest possible speed from them, and expensive crews had to be kept under employment for long periods. Finally, the constant experimenting and repeated unsuccessful attempts involved great delays in completion, with a corresponding increase of cost.

Required speed not impossible.—It is not contended that the department required a higher speed than it was possible to attain with boats of the dimensions specified and possessing the general requirements in matters other than speed which were called for by the contracts. This should be clearly understood. The situation will be plainer if we examine some of the individual results.

Nine of the 28 boats attained a speed equal to original minimum requirements, though in the case of two of these the successful trials took place after the requirements had been modified, and the speed had to be maintained for only one hour, as compared with the original requirement of a two-hour trial.

The Bath Iron Works had offered a speed of 28 knots for their torpedo boats, and this was attained without great difficulty. They were obliged to exceed their contract displacement, however, by an average of about 7 tons. Moreover, they were enabled to accomplish such a result only by the use of designs which were the product of many years' experience in torpedo-boat building by one of the few successful torpedo-boat builders in the world. Had either the department or the other builders had a corresponding experience it would have been reasonable to expect similar results. That the other builders approached as nearly as they did to the same success, in an undertaking in which so many foreign builders had been unsuccessful, reflects great credit on the skill and competency of the American contractors.

The William R. Trigg Company had secured the acceptance of all three of their torpedo boats and one of their two destroyers before the modifications of the contracts were granted. They had offered no excess of speed, however, and their success was purchased at a heavy cost.

The average weight of their torpedo boats was increased from 165 to 194 tons and of the destroyers from 420 to 470 tons. The actual expenses of their trials were about \$80,000 for the five boats, as against a previous estimate of \$15,000 for that purpose. The increase in cost involved in the added displacement was probably even larger, requiring as it did the purchase for the five boats of over 185 tons of additional material of the most expensive character—enough to build another boat.

The other two boats which exceeded the original requirements were the *Stewart* and the *Worden*. In the case of the *Stewart* a speed of over 29 knots was accomplished, but in that case the builders were permitted by the inspectors to keep down the weight at the expense of equipment and fittings, with the result that considerable alteration in those particulars was made by the Government after acceptance.

In the case of the *Worden*, on the other hand, the speed was attained by increasing the weight of the hull and engines until the displacement exceeded that provided in the contract by some 60 tons.

The results accomplished by some of the boats, therefore, suggest that had the department refused to modify the speed requirements, all of the builders might sooner or later have succeeded in attaining the necessary speed. This could have been accomplished, however, only at a cost in time and money entirely disproportionate to the advantage to be gained, and the action of the department in modifying the requirements was undoubtedly justifiable and wise. It is not necessary, however, to argue that question here. We are concerned not with the further expense which would have resulted had there been no modification of the requirements, but with the expense which was, in fact, incurred. All the boats, whether accepted before or after the change in the speed requirements, were enabled to attain an acceptable speed only by a very considerable increase over the designed displacement, all of which had to be paid for, and in most cases a large number of costly experiments. The modification of the requirements merely saved the builders from still further loss.

Responsibility of the department.—It will be remembered that a majority of the builders offered a speed in excess of the minimum requirement. Here, as in their estimates of cost, they were misled by their inexperience and their reliance on the judgment of the department. The department circular stated 28 and 26 knots as the minimum requirements, but encouraged the offer of a higher speed by the statement that such offers would influence the award of the contracts. This was a fair indication that the department considered it possible to attain a higher speed consistently with the other requirements of the contracts. A comparison with the performance of previous boats favored this conclusion, and calculations based upon the amount of power which could be developed by such boilers as were contemplated led to the same result. The difficulties were not yet foreseen. The builders knew almost nothing about the subject themselves, and the department did not properly estimate the complications which would result from the much higher requirements in other matters than speed.

It was as a matter of fact the opinion of the department officials that the minimum speed designated would be easily attained; and this expectation would probably have been realized had it been possible to make the boats sufficiently strong, and at the same time fulfill the exacting requirements in other particulars, with the displacement

originally designed. The exceedingly disastrous effect, in the matter of speed, of "the constant tendency to add additional things for convenience or comfort," it emphasized in the report of Linnard and Chandler. The miscalculation as to weight, power, and strength, including the failure to make adequate allowance for the effects of the miscellaneous requirements, and for the constant tendency to add to those requirements, lies, therefore, at the root of the difficulty. For this miscalculation the department may fairly be held responsible.

Had the builders' troubles been due to the additional speed which many of them guaranteed, they would still be almost equally entitled to consideration, since they were misled by their reliance on the department's calculations. But the action of the department in fixing the same modified requirements for all the builders was a recognition of the fact that even the original minimum requirements were higher than could under the circumstances be fairly required of the contractors.

Difference in number of trials required.—The increase of cost from an unusually large number of trials did not affect all the builders equally. The destroyers of one company, for instance, attained their speed at very nearly the first attempt, while another company had for one destroyer 36 preliminary trials and 3 official trials, covering a period of two years, and for another 19 preliminary and 3 official trials. The experience of the other builders varies between these extremes. But, on the other hand, the increase of cost from increased displacement, and therefore increased quantity of material, very nearly compensate for this difference. Thus the destroyers first mentioned contained an average of 63 tons more material than their contract had contemplated, the largest excess found in any case. On the other hand, the two destroyers requiring the largest number of trials were those in which the builder was most successful in the attempt to conform to the contract displacement, and the boats had an average excess of only 20 tons. But this result was accomplished only by expending a great deal of pains and money on perfection of design, and by many costly experiments.

The Bath Iron Works suffered least from the requirements as to speed and displacement since their excess of weight was only about 7 tons per boat, and they attained their speed without any excessive number of trials. But here again their advantage was probably fully balanced by the initial expense to which they had gone in the purchase of plans and information from M. Normand.

Comparison with performance of earlier boats.—In connection with this question of speed requirement it is interesting to recall the result of previous attempts at high speed, as described above. It will be remembered that six boats with a contract speed of 30 knots were under construction in 1898. Of these the *Dahlgren* and *Craven*, small harbor-defense boats built by the Bath Iron Works, made their contract speed by the assistance of M. Normand's plans. The requirements of the other four in other particulars than speed were much lower than those of the boats with which the present bill is concerned. Yet two of them attained their speed only at the sacrifice of proper strength, and the other two failed to attain it at all.

Comparison with experience in England.—The experience of the English Government in this connection shows a remarkable similarity to that of our own Navy Department. The destroyers completed in England for several years prior to 1901 were all 30-knot boats. They were about 10 feet shorter than the American destroyers and ranged in displacement from 275 to 334 tons. During the time that the American boats were under construction it became evident that the English destroyers were deficient in strength and seagoing qualities, and the lesson was enforced by several disasters at sea. As a result the admiralty entirely changed its policy. The boats recently built, while they are of the same length as the American destroyers, have a displacement of about 500 tons and a speed from 25 to 26 knots. Our destroyers as actually completed averaged 466 tons, the modified speed requirement was 26 knots, and the average actual speed was 27½ knots.

The conclusion from this comparison therefore agrees entirely with the statement above made, that the calculations of the department as to displacement were faulty and that the large increase over the designed displacement in the American boats was in fact necessary to the proper development of the type of boat desired.

F. ANALYSIS OF THE CAUSES OF LOSS.

Classification.—The causes of the extraordinary cost of the boats have been classified in the foregoing statement in the manner which seemed most convenient for their orderly presentation. It is possible now, in the light of the preceding discussion, to analyze these causes and obtain a reclassification which will make clearer their bearing upon the question at issue.

For this purpose the causes of the loss suffered by the builders may be grouped as follows:

1. The inadequacy of the contract prices to cover the necessary cost of the work, resulting from the extreme requirements of the contracts as originally defined.

2. The unprepared condition of the steel industries of the country.
3. The increase of cost for which, in various ways, the Navy Department was directly responsible.
4. The general rise in the price of materials and labor.

Under the first heading should be placed the greater portion of the high cost of materials and a considerable portion of the high cost of labor.

A certain part of the cost of materials belongs also under the second head, including the increased cost which undoubtedly resulted from the inexperience of the steel makers. The second head also includes such increased cost of labor and general expense as resulted from the extraordinary delays in obtaining materials.

Under the third heading belong the delays and vexations resulting from the unprecedented severity of the department supervision and such portion of the cost of materials as is chargeable to the extremely severe inspection. Here also belong the losses resulting from the department's miscalculations as to speed and displacement, including the additional material which had to be purchased, the cost of an excessive number of trials, and the direct cost and many delays resulting from constant experiments in the attempt to fulfill the speed requirements and at the same time conform as nearly as possible to the contract displacement. Finally, this heading includes the very serious losses which resulted from the constant addition of new requirements, the fulfillment of which not only increased the cost directly but added immensely to the difficulties of the problem of speed and displacement.

Responsibility.—It will be noted that that portion of the loss which is thus grouped under the first two heads could in no way have been avoided either by the department or by the builders except by modifying the original requirements of the contract. That portion is therefore properly chargeable to the inadequacy of the bids and, back of that, to the corresponding inadequacy of the appropriation and the upset prices. For so much of the loss, in view of all the circumstances above stated, it is certainly fair to say that the department was in large measure responsible.

The causes of loss included under the third head were entirely beyond the control of the builders, and for that portion the department was directly responsible.

There remains to be considered only the general rise in the prices of material and labor. Were the case not peculiar in other respects these causes of loss would properly be regarded as ordinary business risks for which the builders ought to have provided in their bids, and it would follow that if they did not choose to make such provision against the chances of the future the loss must be their own. But before the builders could be asked to make provision for such chances in their estimates of cost they must have some definite basis upon which to make such estimates. Had it been possible for them in the present instance to prepare anything which could fairly be called a definite estimate of cost, we have no right to assume that they would not have made allowance for a possible rise in prices and wages. As it was, the majority of them bid very nearly up to the limit of the upset prices.

Elements omitted by Ramsay Board.—It is important to recall the fact that one important element of loss above enumerated was entirely omitted from consideration by the Ramsay Board. This is the loss resulting from the unusual number of trials required for most of the boats. It must be apparent from the preceding discussion that the equity in favor of the builders in connection with that portion of the loss is particularly strong.

But there is another element of loss which is also not represented in the figures of the Ramsay Board and which was probably still more serious. This is the increase of indirect expense resulting from delay. The construction of the vessels, in spite of the utmost efforts of the builders, extended over a period which averaged more than two and a half times as long as the original contract time. The increase of indirect expense from such delays must have been very nearly in the same proportion; yet the Ramsay Board, while adopting a percentage for indirect expense which would have been very conservative had the work gone forward without hindrance, made no allowance whatever for this increase from delay. It should be added that in most cases the contractors' own statements of cost equally omitted to make adequate allowance for extraordinary delays in the item of indirect expense, allowing the same percentage which in their experience they had found it necessary to charge for similar work when no such delays occurred.

It therefore appears that the theory upon which the compensation proposed by the present bill has been reckoned leaves out of account certain elements of loss as to which the claim of the builders for compensation is particularly strong.

As to the inexperience of the builders.—Another probable cause of increased cost has not yet been considered. It is doubtless true that the work cost more than would have been the case had the contractors been experienced in the construction of such boats, though there is no means of estimating the amount of this element. That it must have been surprisingly small is indicated by comparisons presented below with the cost of English boats, and particularly with certain estimates of proper cost furnished by

the department bureaus to the Ramsay Board. But it does not follow that the contractors ought to bear such increase of cost as may have thus resulted. Their inexperience was one of the known conditions at the outset, and the department doubtless intended to fix upset prices which would be adequate for the construction of the boats by builders generally competent but inexperienced with this particular type. Good faith would have required no less. Moreover, the department itself was almost equally inexperienced. A large amount of costly experimenting had to be done before either builders or navy officials could learn the solution of their problem. It would hardly be reasonable to say that the contractors ought to bear all the cost of educating both themselves and the Navy Department in the art of torpedo-boat construction.

As to competent handling of conditions.—The one element of loss for which the builders may properly be held responsible is that which may have resulted from their own inefficient handling of the conditions, and the only practicable method of determining the amount of this element would be to compare the actual cost in the case of the different builders. If the figures showed a wide divergence, it might fairly be concluded that to a certain extent, though not wholly, this divergence was due to the superior competence which some of them displayed. This is the best justification for the theory of average cost upon which the present bill is based. While only one of the builders will receive the full amount of his loss, the inequality will tend to reward the most competent handling of the difficulties which the work involved. An examination of the figures shows that the excess of actual loss over the amount payable under this bill is largest in the case of the company which entered upon the work with the least experience and preparation, while the company whose preparation for the work was most complete will receive very nearly the amount of its actual loss. Under these circumstances there is little ground for fear that the builders will receive compensation for losses due to any fault properly chargeable against them.

G. COMPARISON WITH ENGLISH PRICES.

Contemporary English prices.—In connection with the actual cost of the boats it is interesting to compare the cost of similar boats in England. While English prices, as already pointed out, would not have furnished a reliable basis for the contractors' estimates in advance, because of the uncertainty as to what differences there would be in the type of boat and in the details of construction, and also because of the difference in the prices of labor and materials in the two countries, they are not without some value as a means of comparison after the work has been completed and the data necessary for intelligent comparison are available. Thus it proved true in practice that the cost of both materials and labor of the same quality was higher in this country than in England, and the destroyers built in this country, when the details of their requirements came to be worked out, while not of as high speed as the English boats ordered about the same time, were characterized, on the other hand, by a higher standard as to structural strength and miscellaneous requirements, which must have fully compensated for the difference in speed. Yet the average price per ton paid for the English boats was \$894, as against an average contract price per ton for the American boats of \$673. At the rate per ton which thus prevailed in England these boats would have cost \$375,000, almost exactly the fair average cost reported by the Ramsay Board, and \$93,000 more than the average contract prices of the American boats. While it is true that the increased displacement of the American boats would naturally reduce somewhat the price per ton, so that the estimate of the prices which would have to be paid in England ought to be correspondingly reduced, this reduction would certainly no more than compensate for the difference in the cost of labor and materials.

The comparison as a whole makes it tolerably clear that, in spite of their inexperience and the peculiar difficulties which they encountered, the American builders completed their work at a cost which compares very favorably indeed with the prices actually paid for similar boats in England.

Earlier English prices.—The English prices referred to in the foregoing comparison are those charged for boats ordered about the time the American contracts were placed. In this connection it is worthy of note that for earlier English boats of the same general requirements the prices per ton had been much lower and had corresponded almost exactly with the upset prices fixed by the Navy Department for the American boats. This fact suggests the probability that the department was misled by a reliance on these earlier English prices. It also indicates that the experience of English shipbuilders as to estimates of cost may have been somewhat similar to that of the American builders.

H. STATEMENTS OF NAVY OFFICERS AND DEPARTMENT OFFICIALS.

The contentions of the builders are in general amply supported by the opinions expressed by those officers of the Navy Department and the navy who have had occasion officially to comment upon the various phases of the matter. In these official comments, however, a few unfavorable criticisms are found which will first receive attention.

It will be remembered that the letter addressed by the committee of contractors to the Navy Department, on January 17, 1902, was referred to the bureaus of Construction and Repair and Steam Engineering, and also to the board on construction. The latter board consists of the chiefs of the two bureaus last mentioned, together with the Chiefs of the Bureau of Ordnance and the Bureau of Equipment, and the Chief Intelligence Officer. Its members at the time were Admirals O'Neil, Melville, Bowles, Bradford, and Sigsbee. Four of these officers concurred in a report recommending both the modification of speed requirements and the financial relief asked by the contractors. Admiral Bradford submitted a minority report, which will now be examined.

Admiral Bradford's criticisms.—The majority of Admiral Bradford's criticisms were merely in the direction of caution, and have since been met by the thorough investigation which the case has received. Many of them are sufficiently answered by what has been said in the course of the preceding discussion. Thus, in the matter of speed requirements his criticisms are based upon a comparison with the performances of the *Farragut*, *Bailey*, *Porter*, and *Dupont*, and the earlier English destroyers. The faults which all these boats developed, and the increased difficulties resulting from much higher general requirements in the new boats, tending to make such a comparison unreliable, have already been sufficiently explained. The boats under consideration much more nearly resembled in general characteristics the later English vessels of 25 and 26 knots, and Admiral Bradford's rejection of those boats as a basis of comparison must have resulted from inaccurate information.

In connection with the subject of financial relief, only two of Admiral Bradford's suggestions require separate treatment. He states that "by means of low bids very responsible bidders were excluded from making contracts for these vessels, especially the Herreshoff Manufacturing Company, which no doubt could have constructed the torpedo boats in accordance with the requirements, since the latter were based on vessels which they had already built." This statement was entirely inaccurate, since the bids of the Herreshoff Company were rejected simply because they were received too late and could not properly be considered. As a matter of fact that company bid \$166,000 for torpedo boats, which was less than the bid of the Columbian Iron Works and only \$1,000 larger than the bid of Lewis Nixon.

Admiral Bradford intimates that the loss to the contractors was due to delays resulting from their subsequently taking on more favorable contracts, so that their yards were overcrowded. Of this it is sufficient to say that it was not true. The Navy Department had its inspectors at every yard, minutely supervising the progress of the work. These inspectors must have known whether the contractors were delaying because they were devoting their energies to other contracts, or because of their inability to obtain materials and to secure the approval of their detailed drawings.

The Navy Department did not grant the contractors repeated extensions of time, waiving penalties for delay without careful investigation, and as just pointed out the department had its own men on the ground to aid in such an investigation. The action of the department is a sufficient answer to Admiral Bradford's suggestion.

Naval Constructor Woodward's testimony.—The testimony of Naval Constructor Woodward before the House committee also deserves special attention. Captain Woodward had received a very thorough education in naval architecture both in this country and in France, and had had some experience in torpedo-boat construction, since he had had charge of the design of the hull for the torpedo boat *Ericsson*, one of the earlier boats built in this country. He had also been on the trial board and been present at practically all the trials of such of the boats now under consideration as were built on the Atlantic coast. He had not, however, been concerned in the preparation of the plans nor been familiar with the circumstances under which the contracts were placed and the conditions which affected the high cost of construction. On these questions he had made a hasty preparation by examining the records on file in the department.

Captain Woodward emphasized the fact that the speed originally required for these vessels was somewhat less than the maximum previously attempted, making a comparison with the *Porter* and *Dupont* and *Farragut* and with the English vessels. But at the same time he criticised with considerable severity the structural strength of all

these earlier vessels, and stated that the adoption of lower speed requirements "was not only justified but demanded" by the behavior of the previous high-speed boats. He also pointed out very emphatically the comparatively small value in connection with this work of experience with vessels of other types.

His testimony contains an interesting comparison of the weights of the principal scantlings of the midship section of the *Porter* and *Dupont* with the same on the *Stockton*, one of the new boats designed by the department, showing only a very slight increase in weight in the designs for the *Stockton*. This comparison supports the statement made above, that although greater structural strength was demanded in the new boats, the other requirements involved such an increase of weight that practically no margin was left for increasing the weight of the hull if the designed displacement was not to be exceeded.

Data for estimates.—The portion of Captain Woodward's testimony which calls for most careful analysis is that relating to the data which the bidders had at their command for estimating the probable cost. He states that on October 1, 1898, the *Farragut*, then building by the Union Iron Works, was reported as 97 per cent completed, and that on the same date the *Dahlgren*, building by the Bath Iron Works, was 90 per cent completed as to hull and 80 per cent as to machinery. From these facts he draws the conclusion that both these companies should have been in a "particularly satisfactory situation to know what the cost of constructing such boats actually was." October 1 seems to have been selected for the date for this comparison because it was about the time that the contracts were actually signed. Captain Woodward doubtless intended to be fair, but it is difficult to understand how he came to overlook the fact that the bids were opened in the preceding August, and that the contractors were therefore obliged to base their estimates upon data available at least two or three months before October 1. The conclusion of Secretary Long, that at the time the bids were made the builders had not progressed far enough with their earlier contracts to obtain much experience of the special character required, is much more accurate.

Moreover, as we have seen, all the earlier boats differed so substantially in material, designs, and general requirements that comparisons based upon their cost were of little value.

Captain Woodward also referred to the bid of the Herreshoff Manufacturing Company and to the fact that that company had previously completed the *Porter* and *Dupont*.

But when we examine his conclusion from all these observations we find that it in fact contains nothing at variance with the claims of the contractors. This conclusion is as follows:

"It would seem, therefore, that in the cases of these two bidders the amounts of their bids (Bath Iron Works, \$161,000, Herreshoff company, \$166,000) appear to fully justify the reasonableness of the department's estimate made at that time, namely, that with the prices of labor and material then current, torpedo boats fulfilling the requirements of the department's circular could, at the rate that had been charged in the past for similar work by responsible American builders, be built at a cost of not more than \$170,000 each."

The obvious comment upon this statement is that there were practically no current prices for the quality of material required, and that boats "fulfilling the requirements of the department's circular" and the further requirements which were added as the work progressed could not be built "at the rate that had been charged in the past" for the building of the American torpedo boats. That the department's estimates were justified, in the sense that the causes which rendered them inadequate could not possibly have been foreseen in advance, is not only freely admitted, but affirmatively asserted by the contractors.

Some inaccuracies.—Captain Woodward's statements as to the upset prices and as to the contemplated displacement are somewhat inaccurate. He refers to the fact that one of the bids for these boats which was not accepted was considerably in excess of the upset price. This bid was made on the bidder's own plans, and it may have been hoped that those plans would appear to the department so excellent as to cause a departure from the requirements. The language of the department's circular was emphatic, however, and the upset prices were necessarily limited by the appropriation. The bid was not in fact accepted and there is no reason to suppose that any such bid would have had any chance of acceptance. In the matter of displacement, also, Captain Woodward argues from the case of the *Farragut*, in which a displacement many tons less than that contemplated by the contract had been accepted, that the bidders ought not to have regarded the provisions as to displacement in the case of the new boats as binding. Here again, however, the language of the circular was explicit, and declared that no bids for destroyers of more than 235 tons or for torpedo boats of more than 170

tons would be considered. A large excess of displacement was afterwards permitted simply because the department frankly recognized its own responsibility for the excess.

As to inspection.—In connection with the matter of government inspection, Captain Woodward quotes the passage from the report of Linnard and Chandler, already referred to. His idea seems to have been that since the builders were expected to work out the designs they should be held solely responsible for their excellence unless it appears that they were compelled by the inspectors to adopt designs which they did not approve. As we have already seen this was sometimes true, but the principal contention of the builders in this connection is not that the inspectors prevented them from securing the best designs, but that the many additional requirements imposed greatly increased the difficulty of their problem, and that the whole system of supervision and inspection necessarily increased their expense.

As to purchase of plans and information.—In connection with this question of designs and the responsibility of the builders for their excellence, Captain Woodward advances the somewhat surprising contention that the other builders ought to have followed the course adopted by the Bath Iron Works and purchased of foreign builders the information and experience which neither they nor the department possessed. That this course proved advantageous in the case of that company is, of course, true, but it also involved a very large expense, much larger than any profit which the Bath Iron Works hoped to make on these particular contracts. They might properly make such an investment if they chose to take the chance of ultimately making it good by a great many contracts of this character. It was hardly an investment which the Government had a right to demand, or which the Navy Department did in fact expect of the other builders.

While not questioning the losses of the other builders, Captain Woodward professed to doubt whether the Bath Iron Works had in fact lost any money on these contracts, because they did not tell him so at the time when the boats were tried, and because they declined to submit a detailed statement of the cost to the Ramsay Board. This reticence on their part was adequately explained to the committees, as has already appeared. Meanwhile, there is no reason whatever to doubt the veracity of the testimony and the written statement presented by the vice-president of the company to the committees.

Summary.—Taken as a whole, Captain Woodward's testimony is evidently a defense of the department, and his principal conclusion is, in substance, that the department's estimates were as accurate as could be expected. He evidently felt also that the department should not be held responsible for the difficulties which the builders had encountered. On the first point no defense was necessary. As to the second, it is perhaps sufficient to say that his superiors were ready to acknowledge a much larger share of responsibility than Captain Woodward was disposed to admit. Had his examination of the circumstances affecting the case been less hasty, and had it not been practically confined to the information which appeared in the department's records, it is not believed that he would have been disposed to dispute any of the contentions of the builders.

Report of Linnard and Chandler.—The report of Messrs. Linnard and Chandler is very instructive in the light which it throws upon the difficulties of the problem undertaken. The entire report should be read, but one passage contains in concise form so many instructive comments as to justify its quotation in full at the expense of some repetition:

"The torpedo boats previously built had been generally of much smaller size and much lower requirements as to speed, and it is believed that those who built them (except perhaps the Herreshoff Manufacturing Company) had had considerable difficulty in their completion. The building of successful torpedo vessels having the 'highest practicable speed' is an occupation that requires designing talents of a high order and prolonged experience in construction. There are comparatively few successful builders of torpedo vessels in the world; but the attempt was made in this country to rival the best results attained abroad with designs which were not based on the known results of a large number of previous vessels, and by builders whose knowledge and experience were of a limited character.

"At the time these contracts were taken these contractors evidently thought that the department's designs, or their own, would be entirely adequate to fulfill the programme laid down without difficulty, and they apparently went into the contracts with a light heart. As above stated, their experience, now that these vessels are approaching completion, shows that the difficulties of fulfilling the requirements have been enormous and the cost to the contractors very largely in excess of the contract prices. As a number of these contractors have comparatively small plants and capital, it is our opinion that if harshly dealt with they will undoubtedly be forced to the wall. * * *

"The situation is further complicated by the probability that a number of these vessels will fail to obtain their contract speed, or even that lower speed which, deducting penalties, allows them to be accepted at all. Under these conditions the contractors universally seem very much depressed, and from their conversation it would appear that while no concerted action has been taken up to the present time, they will in all probability appeal to Congress for relief.

"The grounds for this action, which have been outlined by them in conversation, are various, but the one which nearly all adopt as a basis for the claim is that they were led to believe that the plans and specifications furnished by the Government were adequate to achieve the results contracted for. That that is not the case is now evident, and is due to a variety of causes. All the vessels built on the department's design that have been tried are greatly overweight, and they all appear subject to excessive vibrations, causing breakdowns when the machinery is running at high speed. The weights allowed in the designs required the most careful study of details, and the omission of everything nonessential to keep within the allowance, and it is doubtful, even with the most careful supervision, whether some excess would not have occurred, though doubtless many weights are in excess of those upon which it would have been feasible to design details of hull, fittings, and machinery. Moreover, the constant tendency to add additional things for convenience or comfort produces a peculiarly disastrous effect on these extremely light vessels, in which every particle of excess weight becomes a most serious handicap to the attainment of the required speed.

"The question of vibration on vessels which have very high-speed engines requires the most careful consideration of structural arrangement to secure combined strength and lightness, and a prolonged study of the balancing of the engines. That these matters have not been sufficiently attended to is obvious from the results so far obtained.

"The contractors feel, with some reason, that as they bid on department designs, or, in some cases, on bidders' designs closely akin to the department's designs, they are not responsible for the failure to achieve results aimed at, and they all insist upon their good faith in endeavoring to carry out the department's wishes."

Such testimony from an official source is obviously entitled to great weight.

Report of the bureaus.—The joint report of the Bureau of Construction and Repair and the Bureau of Steam Engineering upon the letter from the committee of contractors presenting the first request for relief contains the following statements:

"We do not hesitate to say that had the department and the contractors been possessed in 1898 of the experience now gained in connection with these boats, their contracts could never have been made. In view of the above we are of the opinion that the department should take such steps as are within its power to facilitate the trials and delivery of these vessels, and that the circumstances of the case are such as to warrant the department in sharing with the contractors the financial losses which have been incurred. * * * We recognize the force of the contractor's statement, and consider that they have an equitable claim of a nature which has been recognized and accepted in many past cases by Congress. We believe, however, that it can not be granted without congressional action."

The majority report of the Board on Construction concurred with the joint report of the two bureaus.

Bureau estimates furnished to Ramsay Board.—The estimates furnished by certain of the bureaus of the Navy Department to the Ramsay Board, covering the proper cost at that time of certain portions of the boats, furnish as clear proof as could be desired of the inadequacy of the contract prices. The Bureau of Steam Engineering was asked to estimate the cost of "the propelling engines, including piping, the boilers, including piping, the auxiliaries and engineering appurtenances, including piping, and the duplicate pieces of machinery required to be furnished by the contractor." The Bureau of Equipment was asked to estimate the cost of the electric plant and of the "outfit other than electric plant."

The estimates furnished were, of course, only approximate, but they correspond very closely with the cost of the same items as reported by the builders in their sworn statements.

Thus the bureau estimates of the cost of machinery and electric plant were slightly larger than the actual cost reported by a few of the contractors and somewhat smaller than that reported by others. In the case of the equipment other than electric plant, the bureau estimate was considerably smaller than the reported actual cost, but this difference is accounted for by the fact that the statements of the contractors included under this head a number of items which were not included in the bureau estimate.

When attention is called to the extraordinary delays and other difficulties which had affected the actual cost, a comparison of the builders' statements with the bureau estimates reflects the greatest credit upon the builders and furnishes the strongest

evidence of the efficiency and the economy with which the contractors had handled their work.

But the most interesting information furnished by the bureau estimates becomes apparent by comparison with the original contract prices. Thus the Bureau of Steam Engineering placed the approximate cost of the machinery for the destroyers at \$207,700. The Bureau of Equipment estimated the cost of the electric plant at \$7,877 and the cost of the outfit other than the electric plant at \$3,135. These figures covered only labor and material, making no allowance for general expense. Their total is \$218,722, while the average contract price for the destroyers was only \$281,750. This leaves a balance of only \$63,000 for the construction of the entire hull, the installation of ordnance, the cost of speed trials, and the entire allowance for general expenses. For the torpedo boats the total of the corresponding estimates is \$116,375. Subtracted from the average contract price, this leaves \$36,545. The item of general expense, reckoned on the basis adopted by the Ramsay Board, and a very conservative estimate for trials would easily use up these balances, leaving nothing whatever for the hulls.

The testimony of the department officials, therefore, confirms beyond question the statement of the builders that the original contract prices and the maximum prices allowed by the Government were utterly inadequate to cover the necessary cost of the boats.

Approval of present request by Navy Department.—The examination of the opinions officially expressed and the evidence furnished by officers of the navy and of the department may be concluded with the statement that the contractors' request for relief was officially approved by Secretary Long, and had the continued approval of the Navy Department at the beginning of the present year. Secretary Long's letter transmitting the papers in the case to Congress, under date of April 25, 1902, after reviewing the case in a statement which, in every point touched upon, confirms the contentions of the builders as above set forth, concludes with the following paragraph:

"With reference to your inquiry concerning the further relief of the contractors by Congress, it appears to be clearly established by the report of the Ramsay Board, transmitted herewith, that the contractors have suffered heavy losses in the building of these boats. It also appears from the accompanying reports of the bureaus concerned that these losses have been due to causes almost wholly beyond the control of these contractors under the circumstances set forth, thereby entitling them, in the opinion of the department, to equitable consideration."

A letter from Acting Secretary Darling to the chairman of the Senate Committee on Naval Affairs, dated January 25, 1904, after describing certain papers inclosed therewith, referred to the recommendation of Secretary Long in the following language:

"The comments made in the aforesaid letter of transmittal and the opinion therein expressed as to the consideration the contractors should receive conform to the department's present views in the premises."

There is no reason to believe that the department has since changed its attitude.

I. VALUE OF THE RESULTS TO THE GOVERNMENT.

An element of the builders' case, of evident importance, is the fact that the Government has received the full value of what it is asked to pay.

In spite of the great difficulties which they encountered in the construction of these boats and in the fulfillment of the government requirements, and the heavy losses which they suffered, the builders continued conscientiously and unremittingly their efforts to conform in every respect to the most rigid interpretation of the terms of their contracts and of the requirements imposed by the department and its inspectors. When they made their first application for any relief, all of them had already expended considerably more than the entire contract price, and the modifications of the contract requirements which they then requested were so reasonable as to receive the prompt assent of the Navy Department. After these modifications were granted they continued their work in the same conscientious spirit until, at the time of the committee hearings, in February, 1904, all but three of the boats had successfully accomplished their official trials and been delivered to the Government. Two of these three have since been completed and accepted.

In the meanwhile three of the contractors had suffered so severely that their business had gone into the hands of receivers. In two cases the work on the uncompleted boats was continued by the receiver, or by contract with the receiver, and they have since been completed and accepted. In the case of the torpedo boats *Nicholson* and *O'Brien*, the Government took possession of the boats, and one of them is not yet quite completed. In accordance with the terms of the contract, all the expenditures of the Government in the completion of these boats will be charged against the con-

tractor and deducted from that portion of the contract price which has not yet been paid.

In the case of these three contractors the money payable under the terms of this bill would go to their creditors, those who have furnished the materials and advanced the money for the prosecution of the work. These creditors, who are thus dependent upon the passage of this bill for at least partial reimbursement of their losses, do not include, however, the large steel companies referred to above from whom the plates and forgings were obtained. Those companies protected themselves by requiring payment in advance or upon delivery, a practice which, incidentally, added another straw to the financial burden of the contractors.

Performance of the boats in actual service.—The performance of all the boats since their completion has demonstrated that the work of the builders was well done. Five of the destroyers have made the voyage to the Philippines, and arrived without mishap, an excellent performance for vessels of a type not primarily designed for long voyages or extended ocean service. At least two others have been through severe gales at sea without injury. Seven of the torpedo boats were in active service during the summer of 1902, covering a distance of approximately 8,980 knots in the course of this time and cruising as far as San Juan, P. R. This experience amply demonstrated the excellence of the boats. In fact, all of the vessels, both destroyers and torpedo boats, have proved efficient and satisfactory.

Both Naval Constructor Woodward, in his testimony before the House committee, and Naval Constructor Linnard and Lieutenant Chandler, in their report already quoted, while strongly commending the excellence of several of the boats, expressed some doubts as to whether a few of them would not prove unsatisfactory. In the former instance these doubts were expressed before the boats had been tested in service and in the latter before they had been completed. Captain Woodward criticised particularly two of the destroyers, fearing a lack of strength, while the report of Linnard and Chandler commends the same boats for their general lightness and care in design. It is sufficient to say that the fears of none of these officers were realized, and all the boats have proved themselves thoroughly serviceable. Lieutenant Chandler recently presented to the Society of Naval Architects and Marine Engineers a paper on "the performance of the torpedo vessels of the United States Navy at sea," based upon his own experience with the boats, and the contents of this paper, dealing with six of the torpedo boats and eight of the destroyers, amply justify the statements which have been made above.

Summary.—The results which the Government desired to obtain in these vessels, that is to say, a combination of high speed with strong and durable construction, carrying capacity, completeness of equipment, convenience and habitability, were successfully obtained. The boats not only mark a considerable advance over previous boats of the same type constructed in this country, but will compare very favorably indeed, in the all-round qualities which the Government desired, with the best of the boats which have been built abroad.

Now that the steel makers of the country have learned, at the expense of these contractors, how to make plates and forgings of the highest class successfully, and the Navy Department and the contractors have worked out the difficult problem of design which these boats involve, they could probably be duplicated, not for their original contract price, but for a smaller sum than they have actually cost the builders. But the money that has gone into them represents not only the completed value of the boats, but the cost of learning all the lessons of construction which the department, as well as the builders, had still to learn when their construction was undertaken. Those lessons could not possibly have been learned nor these boats successfully built without costly experiments, and none of the money thus spent has been wasted.

CONCLUSION.

It is believed that the foregoing statement sufficiently discloses the propriety of the relief which the builders ask, and no extended argument will be attempted. It seems proper to point out, however, by way of conclusion, the very peculiar conditions governing naval contracts, making those contracts essentially one sided, and leaving the contractors practically at the mercy of the Navy Department.

In the first place the contractors have practically nothing to say as to the general terms of the contracts. Those terms are fixed partly by Congress and largely by the Navy Department before the advertisement for bids. The Government defines the general dimensions, the quality of materials, the limits of speed and displacement, the time permitted for completion and the maximum price allowed. The bidders can not modify these requirements by negotiation if any of them appear to them unreasonable; they must accept them as they are, or not bid at all.

The requirements having been thus fixed, the contracts are placed by a system of competitive bids, involving an inevitable tendency to ruinous competition. Such competition practically discourages all prudent provision in the bids for unforeseen conditions. The bidder must take all chances if he is to compete for this work at all.

Again, only the most general requirements of the contract are specified in advance. As to the requirements in detail, the contractor not only has no voice in their final determination, but he has no notice, when the contract is undertaken, what they are to be. He must agree to conform to whatever the department may subsequently direct, at the same time bearing all responsibility for the results. Any estimate of cost upon which his bid may have been based is reliable only so far as he may have been able to forecast the future requirements of the department officials. Moreover, he is subject to indefinite delays while the department is examining the drawings he has submitted or considering alterations in the original plans. In short, if he makes a profit on his contract it is more by the mercy of the department than by any protection which the contract affords him.

Finally, if his work does not come up to the requirements, whether or not the fault was his, all his rights under the contract are forfeited and the vessel is taken over by the Government on its own terms.

That contracts performed under such conditions can not be judged by the same rules as ordinary business contracts must be obvious.

Such a situation as has arisen in the present case would be impossible under the practice which prevails in England. Naval contracts there are not placed by competitive bids. The Government invites tenders from contractors who desire to perform the work. The contracts are then awarded at the discretion of the admiralty, with an eye to the previous experience of the contractors, the excellence of any previous work which they may have done, the adequacy of their equipment, and similar conditions. The prices are fixed by negotiation. The general requirements of the contracts are determined, and no others are imposed after the contracts are signed. The inspection is only such as is necessary to see that these general requirements are being observed. Two officers are detailed to inspect all the construction of a certain class which is going on at one time, and these officers visit the various yards at such intervals as are convenient. Finally, if the cost in any case exceeds the contract price without fault of the contractor, the loss is made good. Such matters are promptly arranged by a parliamentary committee, charged with the duty of adjusting them. For the general excellence of the results the Government relies, not upon a constant and rigid supervision and dictation, but on the knowledge of the contractor that any expenditure he may make above the contract price will be made good, and that his success in obtaining future contracts will depend upon the excellence of his work.

The present request for relief is not based, however, upon any claim that our Government ought to adopt the English policy, nor is it intended to criticise the wisdom of the methods adopted in this country. The hardship which those methods impose upon the builders has been emphasized only because it may fairly affect the spirit in which the present question should be approached. The one-sided character of our naval contracts is not itself the ground upon which this relief is asked, but it made possible the entirely unusual combination of circumstances which caused the losses of the builders and which, in their opinion, entitle them to relief.

These unusual circumstances are, briefly, the absolutely new and special character of the problem which the work involved, the known inexperience of the builders with work of that character, their natural and proper reliance on the judgment of the department, the entire inadequacy of the maximum prices which the department allowed to cover the necessary cost of the boats, the miscalculations involved in the government requirements as to speed and displacement, the unprecedented extent to which the power of inspection and supervision was exercised, and the continual imposition of further requirements immensely increasing the difficulties and expense of a work which even without these additional requirements demanded the greatest skill for its successful completion and could not possibly have been completed without serious financial loss.

That such a case is peculiar goes without saying, and it would seem that a stronger case for relief could hardly be presented, nor one involving less danger that the precedent could ever be misused. That a similar combination of circumstances would ever be permitted to arise is not likely; but if the case should be repeated in all its hardship it is certainly to be hoped that the Government would then be equally just.

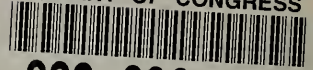
The Government and the builders undertook together a task whose difficulties neither of them could foresee, but the conditions of the joint enterprise were such that the builders must bear all the burden of unforeseen difficulties and all the risk of failure and loss. The difficulties were overcome, and successful results were achieved. The Government enjoys the fruits of its success; the builders have borne

the cost. The Navy Department promptly recognized the equities of the situation, and recommended to Congress the relief for which the builders ask. It now rests with Congress to deal with that recommendation as it shall deem just.

ANDREW G. WILSON,
General Manager, Maryland Steel Company,
LILBURN T. MYERS,
Receiver, William R. Trigg Company,
FRANCIS T. BOWLES,
President Fore River Ship and Engine Company,
Committee

DECEMBER, 1904.

LIBRARY OF CONGRESS



0 029 826 151 0